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Event and Comment.

Women in Wartime Agriculture.

IN Queensland, as in the other States of the Commonwealth, the Women's Land Army is doing a splendid job and rural life will be the richer if many of the girls decide to stay in the country, and thus help in making the social life of the districts in which they settle. Members of the W.L.A. seem to merge unconsciously into their surroundings and so become an accepted part of the rural scene, as they are of agriculture's war effort. And the association of town girls with the practical side of country life will lead, no doubt, to a more complete understanding between town and country when peace returns.

Besides the Women's Land Army, there is the great unenlisted legion of farmers' wives and daughters who ever since the outbreak of the war have continued to share the burden of farm management without any distinctive uniform, or glamour. When the story of Australia's war effort on the home front is written, no finer section of the record will be that descriptive of the wartime work of the country women of the Commonwealth who have taken their part in every farm activity from planting time to harvest; who have carried on the seven-day routine of a dairy; and who, on pastoral holdings, have taken on the ordinary work of station hands, including fencing, boundary riding, and going on the road with travelling stock. The unenlisted legion of country women who are remaining on active service on farms and grazing selections while their men are on active service at battle stations has merited the finest tributes their fellow Australians can offer to them.

What Country Women Want.

MENTION of the wartime work of women in rural industry naturally suggests the need for a wider appreciation of the practicalities of country life, especially in relation to the farm home, when post-war planning is undertaken. It is the woman on the land who makes the farm home, and on her success in home making the smooth working of the farm as a business very often depends. Therefore, no scheme of rural reconstruction will be complete without full provision for modern amenities in the farm home and in country centres. It is suggested that among other amenities, three main services—water, sewerage, and electricity—should be a national responsibility. Better housing and furnishing and cheaper refrigerators also should be included in regional developmental plans. Modern transport providing the convenience and advantage of regular store deliveries to the farm home also should be part of a rural reconstructional programme. The advantages of modern education should be brought within easier reach of the farm family. There is no sound reason why the sons and daughters of the food producers should have fewer educational opportunities or facilities than city children. It is good to observe that with the extension of educational advantages, as provided for in recent legislation, there is a more general recognition of the importance of having a complete system of training available to every youngster in the community. Decentralisation of university tuition and technical training, with due regard always for the requirements of rural industry, is one of the clamant needs of country life. Country women want an educational system devised to meet the needs of the rural population, equally with that of the city. Furthermore, there are many country women themselves who feel the need of some specialised instruction in food preservation, home crafts, and other branches of rural domestic economy. When peace returns, such instructional courses might be provided wherever expert tuition is required. There also are many women farmers who would welcome simple instruction and information on the results of scientific research, and the application of scientific principles to small-scale agriculture. There may be a distinction between what country women want and what they need, but in a properly organised rural community there should not be any excuse for what may be described as mental starvation. Country women require opportunities for service in addition, perhaps, to ordinary social and patriotic activities; and opportunities for creative work. A complete educational system would supply all these needs, and among the first things regional planners might study are the things which country women want. Especially so if we accept the view that the land must contribute largely to the required increase in the population of Australia, without which all talk of reconstruction and new orders is empty, vain, and valueless.

Breeding Grain Sorghums for Queensland.

L. G. MILES, Research Officer, Biloela Research Station, Callide Valley.

SORGHUM, as cultivated for grain, is a crop of great antiquity and has been the staple food for millions of people in addition to domestic stock. The sorghum group is of wide distribution, the main centres of origin being South, Central, and Northern Africa and a belt from the Mediterranean region east to India, China, and Malaya.

Many varieties were introduced into the United States during the nineteenth century, but it was not until the early part of the present century that sorghum became an important crop in the dry south-west—the so-called "Southern Great Plains" area. All the original varieties were tall and the seedheads had to be harvested by hand; the heads were then fed whole or ground or were threshed in a suitable small-grain thresher. It was in America that dwarf types were first recorded, occurring probably as "sports" in the old standard varieties, and it was only when these dwarf strains came into large scale use that the possibilities of harvesting by machinery were first realised. At this stage, however, the most popular dwarf varieties, such as Dwarf Yellow Milo, were commonly irregular or goose-necked at maturity, and these characteristics made header harvesting difficult and wasteful. American breeders, therefore, set to work and crossed Dwarf Milo with straight-necked varieties, such as the Kafirs, and it was from such crosses that the well known header types—Wheatland, Beaver, and Kalo—were derived.

Sorghums were introduced into Queensland many years ago, and descriptions of grain types may be found in the "Queensland Agricultural Journal" as far back as 1916. It was not, however, until a range of the new dwarf types was introduced and tested that farmers became interested in sorghums as a major grain crop. In 1932-33 a large range of varieties was obtained by the Department from the United States, Egypt, and South Africa. These were grown under observation in the Mary Valley and at Brisbane, then liberated for more extensive testing in the Darling Downs, Callide Valley, and South Burnett districts. It is almost entirely on the best of these importations that the present grain sorghum industry of Queensland is based.

The two great advantages of grain sorghums in Queensland agriculture are—(1) their ability to produce a payable crop on a minimum of summer rainfall, and (2) their adaptability to machine harvesting. Sorghum has, on numerous occasions, proved capable of producing a useful crop of grain under conditions which have caused the complete failure of maize. Once established, the crop can withstand long periods

of hot, dry weather without permanent ill-effects. Plants remain almost dormant during the stress period and show remarkable powers of recovery when the water shortage is relieved. This factor alone is of great advantage throughout most of the sub-coastal agricultural areas of the State, where the uncertainty of summer rainfall makes maize a risky crop. The added advantage of mechanical harvesting is an obvious one, particularly in a wheat district such as the Downs, where headers abound. Even in a district such as the Callide, where winter grain crops are not widely grown, farmers have considered it profitable to purchase headers solely or largely for the purpose of harvesting sorghum.

Sorghum grain is used extensively in the United States for the feeding and fattening of cattle, sheep, pigs, horses, and poultry. Its main uses in Central Queensland, to date, have been for pig and poultry-feeding, while a portion of the crop is in demand for cattle-fattening and drought-feeding of sheep in the west. It is regarded as slightly inferior to maize for general feeding, but is still a very satisfactory grain, particularly when ground and fed with skim milk or some protein concentrate. Dairymen in the Callide have found it profitable to grow considerable crops for pig-feeding, supplemented by skim milk and sometimes by maize or a winter cereal.

Few, if any, crops have no drawbacks, and with sorghum the main trouble is caused by insect pests. In the inland districts the sorghum midge, a small, delicate, reddish bodied fly, is capable of causing serious losses of grain. In the more humid coastal districts severe damage to seed-heads is also caused by caterpillars, particularly those of the maize moth (corn ear worm) and the peach moth.

The commonly grown varieties at the present time are Kalo, Wheatland, Day Milo, and Hegari. Brief descriptions follow:—

Kalo is the most widely grown variety in the Callide Valley and has also attained considerable popularity in other districts. It is not a true dwarf, frequently attaining a height of 4 to 5 feet, but is harvested without difficulty by modern Australian headers. It is a prolific variety, capable of heavy yields under a wide range of conditions. The head is long and club-shaped, and with wide-row spacing may become very heavy. The grain is medium small and reddish-gold in colour with prominent dark spots and blotches. The "neck" is normally long, enabling a header to harvest the heads without taking any quantity of leaf. In addition, the foliage and stalk of this variety are palatable and afford useful feed for stock after the grain has been removed. Its one serious disadvantage is its inclination to lodge under certain combinations of soil and climatic conditions. On the heavy clay loams of the Callide flats lodging appears to be of minor importance and is frequently not experienced at all. On some of the more open softwood scrub soils, however, whole crops in heavy head have been known to go down and render the grain practically unrecoverable. Under such conditions shorter, stockier varieties will be experimented with.

Wheatland.—This variety, formerly known as Wheatland Milo, is one of the original header types evolved in the south-west of the United States of America. It is a short, stocky variety, which stools well and approximates 3 feet in height in this district. Heads are of a somewhat irregular cylindrical shape. The grain is of medium size (larger than Kalo), creamy-yellow tinged with gold, and normally with blackish hulls.

At the Biloela Research Station, Wheatland is a few days earlier than Kalo in its heading and maturity. This variety is strong in the stalk and has not been known to lodge, but in most seasons is not capable of the same yield as Kalo.

Day Milo.—This is a true dwarf, averaging little more than 2 feet 6 inches in height at this station, though late-planted crops elsewhere have been somewhat taller. In maturity, it is one of the earliest varieties tested here. Heads are normally smaller than those of Kalo and Wheatland and are typically oval in shape and very compact. The grain is large and attractive, golden-yellow in colour, with straw-coloured hulls. This variety, except in a short, favourable season, is inferior in yield to the other three described, but on account of its earliness is often useful for late planting.

Hegari is a leafy, spreading variety which stools prolifically and has been used frequently for grazing by sheep. It is likely to vary considerably in its appearance and in its period of maturity, depending largely on seasonal conditions. Height is generally 4 to 5 feet. Hegari has been fairly late in maturity in the Callide Valley, but given favourable conditions at heading time the heads all appear at once and at a very uniform level. Heads are numerous, and may be small to fairly large, but invariably shell out a high percentage of grain; the variety is thus capable of very good yields. Heads are irregularly oval and compact, with the grain bunched closely round the branches. The grain is of medium size, white with brownish red spots, and is very free shelling.

The main objects of a breeding programme at the present time resolve themselves as follows:—

(1) The maintenance of purity in the varieties now grown, and improvements if possible in yield and adaptation. Sorghum when grown in the field is partially cross-pollinated, and if different varieties are heading at the same time in adjacent areas contamination of the seed of both will readily occur. When one considers also the possibility of seed mixtures occurring in planters and harvesters it is readily realised that varieties can soon become very mixed. Continuous effort is therefore required in maintaining the purity of seed stocks from year to year, and small quantities of pure seed are therefore periodically liberated to farmers for replacement of seed stocks. In the process adopted (later referred to as pedigree selection) it is often possible, in addition to maintaining varietal standards, to actually improve the yield or other characteristics of the variety.

(2) The provision of a Kalo type with a sturdier stalk, which will not lodge as maturity is approached. This weakness of Kalo has been referred to, and any improvement in the standing ability of this variety would be a very welcome contribution to sorghum culture.

(3) The development of varieties more suited to humid districts, where grub damage is severe. Observations made by Departmental officers in coastal areas have indicated that loose, open heads are less subject to damage of this kind than the more compact heads of the commonly grown varieties. One of the objects of this work is therefore to provide a number of types with open panicles for testing in such areas.

The methods used to bring about these ends may be grouped under three heads:—

(*a*) *Introduction and testing of new material.*—Since 1933, considerable numbers of new varieties and strains have been introduced,

not only from other countries, such as the United States of America, but also from as near at hand as New South Wales. These strains are now being grown and compared with our standard varieties. Any which show some superiority over existing material will be more critically tested in properly conducted varietal trials, and if they maintain their good characteristics they will be multiplied and liberated to farmers.

(*b*) *Pedigree selection.*—This method, which is one of the fundamental principles of plant improvement, consists in selecting a number of individual plants (or heads) from a variety and growing the seed from each plant in a separate row the next season. The selected heads are covered with a bag prior to flowering, so as to ensure self-fertilisation. The progeny rows are then compared with each other and the best are retained, while the inferior ones are discarded. If some of the better rows still show variability, the process of "head-to-row" selection is continued until superior, true breeding strains are established. Where varieties have become mixed or contaminated this is the most effective method of getting back to the pure original type. It also provides an opportunity of isolating even better types which may have arisen through accidental crossing, or by "sporting" or some other means.

(*c*) *Hybridisation.*—When the desired combination of attributes (such as high yield capacity, shortness, strength of stalk, drought resistance, &c.) cannot be found in any one variety it becomes necessary to cross two or more varieties to bring about the desired result. Thus, if by selection a strain of Kalo cannot be obtained which will be resistant to lodging, the next step would be to cross Kalo with some variety with a stronger stalk. The progeny of this cross would be examined for types like Kalo but also possessing the stronger stalk. Selected plants would then go into a pedigree selection programme for a number of generations until the new type had been purified or fixed. Crossing or hybridisation if carried out to its conclusion is a long and difficult process, but its value lies in the fact that it can achieve results far beyond the scope of straight selection.

Each of these methods finds a place in the programme of grain sorghum improvement at the Research Station, Biloela. Thus, among more recent introductions, Ajax is a variety which has given consistently good results. It is a fairly tall, coarse variety, and rather late maturing. Its head is heavy and compact and the grain large and chalky white in colour. It has been equal to Kalo in yield over the last few years and in trials this year remained erect where Kalo and a number of other varieties were badly lodged. It will therefore be made available for trial on scrub farms where lodging is a serious factor. Another new introduction, which has been named Betty, is capable of heavy yields of large Milo type grain. It has a large, very open head, but is somewhat tall for header harvesting and is also subject to lodging on some soils. This variety will therefore be used in crosses with sturdier dwarf varieties.

With pedigree selection, although only two seasons have been completed, some rather striking results are already evident. Thus, in Kalo, at least three dwarf strains have been isolated from the general material. One of these strains was this year 12 inches shorter than the standard Kalo and was some days earlier in maturity. Its yield was equal to that of the parent variety under fairly good conditions on one part of the farm, while it outyielded its parent in an area where drought conditions were severe. Such strains, of course, require careful testing under a

fairly wide range of conditions before any definite superiority can be claimed, but on their first appearance they are at least promising. It is possible also that their shorter stature may be a factor in enabling them to stand upright on soils which favour lodging. They will therefore be watched with particular interest on farms on which standard Kalo is known to lodge badly.

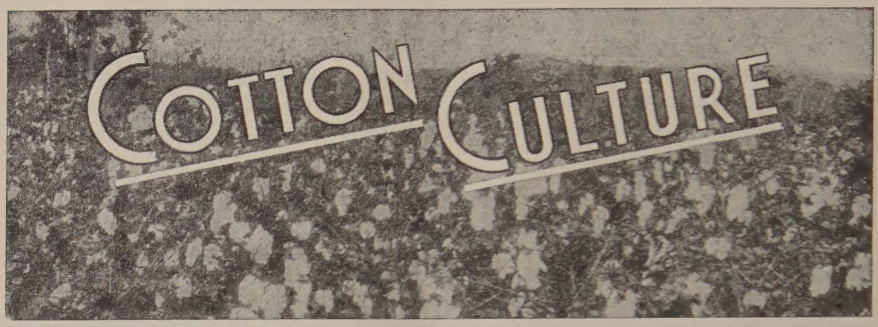
From Wheatland, also, a number of different strains have been isolated. The main difference here was in openness of head, some of the strains possessing a very loose, open head entirely unlike that of the original variety. It is not known yet how the new strains compare in yield with the standard type, though it appears that they are in the same general class. In any case, they will be worthy of trial in the coastal districts where grubs are an important pest.

Some of the newer varieties such as Ajax have proved extremely uniform, with the result that no improvement can be expected from selection. A number of others have shown both major and minor differences. Where the new strains prove inferior to the mean of the variety they are discarded, while those that show some promise are retained for further testing.

To date, only the first two methods of improvement, i.e., testing of introduced material, and selection in established varieties, have had an opportunity of yielding possible results. The third method, hybridisation, may require a period of five to ten years before new strains can be purified and finally tested. Only an indication will therefore be given of the crosses made and the purpose in making them. The two varieties Shallu (Egyptian Corn) and Betty produce a high yield of attractive grain in very open panicles or heads; the former, however, is very tall, and even the latter is taller than is desirable for header harvesting. Each of these has, therefore, been crossed with true dwarfs such as Wheatland and Day Milo with the object of combining dwarfness with the prolificacy and openness of head of the taller parents. Kalo has been crossed with Day Milo, with the object of breeding a Kalo type with a stronger and possibly shorter stalk. Schrock is another variety which has yielded well under local conditions, and possesses the added advantage of a good body of sweet, juicy leaf and stalk. Its disadvantages are its height (5 feet to 5 feet 6 inches), and the fact that its grain is brown and somewhat bitter like that of many of the tall fodder sorghums. It too has been crossed with a dwarf grain sorghum of good quality, in an endeavour to correct these faults.

It will be seen that the objects of the crossing programme in some respects duplicate those of the straight selection work. If the desired results are achieved through selection alone, there will be no need to carry the corresponding crosses through to finality. If, however, some of the newer selections represent only a partial solution to a particular problem, they will be used as stop-gaps pending the development of something better by hybridisation.

The foregoing is not intended as an account of a finished job, but is submitted as a progress report of breeding work at this station on a crop which promises to be of considerable importance to the State. As new varieties give satisfactory tests they will be multiplied for distribution to farmers.



Thinning and Early Cultivation of Cotton.

W. G. WELLS, Director of Cotton Culture.

FARMERS experiencing difficulties this season, brought about by either a loss of labour or by an expansion in their cropping programme creating a shortage of labour, may feel that they can omit thinning their cotton crop without reducing the yield. Many farmers who have grown annually large acreages of cotton have not thinned them because they planted at such a light rate of seeding that only a thin, irregular stand was obtained, which they felt could be left unthinned. If good growing conditions were experienced throughout the season these unthinned crops yielded fairly satisfactorily. If irregular growing conditions, characterised by either excessively wet or very dry periods occurring at critical stages in the development of the plants, were experienced, then both yield and quality of the crop frequently suffered severely. It is strongly recommended, therefore, that the cotton crop be thinned sufficiently to enable the plants to produce a satisfactory yield of good quality if suitable cultural methods are employed and very severe climatic conditions are not experienced.

In order to reduce the costs of both the thinning operations and the early cultivations it is urged that the suitability of the crop for cross harrowing be carefully tested. Where the stand of seedlings is thick enough, and the surface of the field is sufficiently free of trash and pieces of roots to allow of cross harrowing being done with a spike-tooth harrow, many bunches of the cotton seedlings can be eliminated by this operation without adversely affecting the stand. The removal of these excess plants prevents the development of the spindly type of growth, which usually occurs with too thick a stand of seedlings. Where the stand is good enough to allow of three or four cross harrowings being carried out, it has been found that only sturdy, well rooted, fairly well spaced plants are left at the last operation.

Sufficient evidence is not available to indicate whether the stand of plants remaining after a crop has been cross harrowed two or three times can be left without further plants being removed by hoe thinning. Generally speaking, it appears advisable to err on the side of wide rather than too close spacing. It is suggested, therefore, that where, after the last cross harrowing, the stand is still fairly thick or irregularly spaced, so that there is some degree of crowding, the excess plants be thinned out with the hoe to leave the plant spacing mostly used in the district for the particular soil type. The final thinning out with the hoe of any excess plants left by the cross harrowings can be done over a considerable period without adversely affecting crop development. The cross harrowings thus reduce the amount of hoe thinning required per acre

and also allow of this thinning being done over a longer period than normally, both of which are factors of great importance under present conditions.

Where either the stand of seedlings obtained is too thin, or the surface of the field is not suitable to allow of a cross harrowing being employed, it is strongly recommended that the plants be thinned out with the hoe to the most suitable spacing. Thinning in this instance should be commenced when the plants are about 5 inches tall and should be completed before they have exceeded 8 inches in height (Plate 71).

Plate 71.

A Field of Cotton in Good Condition for Hoe-thinning.—After the thinning is completed this field should be cultivated to establish a mulch around the plants. Note the light goose-necked hoe, which is the most suitable implement for hoe-thinning clean cotton.

The most suitable spacing of the plants depends on the type of growth which may be expected to develop under the usual range of climatic conditions experienced during the growth of the cotton crop. Where large plants can normally be expected, it mostly appears advisable to space out farther than where smaller plants are usually produced. Generally speaking, however, spacings of less than 12 inches and more than 24 inches do not appear to be advisable. The following single-plant spacings in rows 4 to 4½ feet apart are recommended:—

Central District—12 to 18 inches on the fertile soils and 18 to 20 inches on the less fertile, harder soils;

Upper, Central, and South Burnett—20 to 24 inches on the fertile soils and 18 to 20 inches on the less fertile soils;

Southern District—20 to 24 inches on all soils;

Western District—15 to 18 inches on all soils.

Early Cultivation.

Early cultivation of the cotton crop is particularly necessary under the climatic conditions of this State. In the districts south of Mackay, early planted cotton can be expected to produce better than cotton planted in late November or December. Most farmers in these areas plant their cotton following the first rains occurring after the first of October, and some farmers plant any time after mid-September, whenever suitable moisture is available. If the planting rains are rather light, planting is frequently done without a pre-planting harrowing in order to obtain the fullest benefit of the moisture present. Consequently, weed and grass seedlings may germinate at the same time as the cotton seedlings, and unless a cross harrowing is made before the latter appear a considerable amount of weed growth may occur in the row of cotton, especially if showery conditions follow planting. If the field is harrowed after the planting rain before the cotton is planted, and no further rain occurs until the cotton plants are of some appreciable size, no difficulty should normally be experienced in maintaining a clean crop during the early stages of cultivation. Many growers give the early planted cotton crop little attention, however, for some time after planting it, particularly if further rains are experienced, to permit the planting of other crops. This is most inadvisable, as there is always the danger of prolonged showery conditions occurring when the cotton seedlings are small; and unless the field is kept clean prior to this the resultant weed and grass growth may either cause the abandonment of the crop or greatly increase the use of hand labour to clean it. It is highly advisable, therefore, to maintain a clean field of cotton, particularly in its younger stages of growth.

Emphasis has already been placed in this article on the merits of cross harrowing to thin out the excess cotton seedlings, if conditions are suitable for employing this operation. It is also stressed that, if a

Plate 72.

Cotton Seedlings in a Suitable Stage for First Inter-row Cultivation.—Where the young cotton crop is not cross-harrowed, the first inter-row cultivation should be done when the cotton seedlings are 2 to 3 inches high.

sufficiently thick stand of cotton seedlings is obtained to allow of three or four cross harrowings being given, with the first one done as soon as the cotton seedlings are 2 or 3 inches high, the amount of the usual inter-row cultivation and chipping with the hoe generally required to keep cotton clean in a showery spring can be most appreciably reduced. Cotton growers should definitely pay more attention to this aspect of their cultural operations.

Where it is found that cross harrowing cannot be practised, then the usual method of inter-row cultivation, for which the farmer is equipped, should be employed as soon as the rows of cotton are discernible (Plate 72). This operation will destroy any weed and grass seedlings germinating between the rows at the same time as the cotton. A similar cultivation should be given following each storm occurring during the early development of the cotton crop. This procedure will not only allow of efficient control of weed and grass growth between the rows being obtained, thereby making more of the moisture present in the soil available to the cotton plants, but the maintenance of the mulch on the surface of the soil will increase the penetration of each rain experienced. It is pointed out, however, that where a disc cultivator is used in cultivating young cotton the small ridge of soil and plants formed by the discs cutting the soil away from it should not be left with the sides exposed for a lengthy period of dry weather. The ridge will dry out and set so hard under such conditions, particularly if a heavy storm preceded the cultivation operation, that the growth of the young plants will be retarded.

A considerable acreage of cotton is ploughed out each season through the crops becoming over-run with grass and weeds. Undoubtedly, much of this could be avoided if all growers maintained clean cultivation in the early stages of growth of their cotton crops. It is appreciated that, with the present labour position on many farms, it will be difficult to maintain a satisfactory state of cultivation by ordinary methods. It is strongly recommended, therefore, that cross harrowing be employed wherever possible, for a marked reduction in labour requirements to cultivate and thin the cotton crop can be effected thereby.

INSECT PESTS AND PLANT DISEASES.

—oOo—

Will readers please note that VOLUME III.—INSECT PESTS AND PLANT DISEASES—of the **Queensland Agricultural and Pastoral Handbook** Series, is now out of print. A revised edition is now in course of preparation for early issue.

The Avocado.

R. L. PREST, Fruit Branch.

THE avocado, originally indigenous to Mexico, has been cultivated since time immemorial. It very early spread through Central America, Peru, Antilles, later to Brazil, and in 1871 was established in California, where, during the past twenty-five years, avocado growing has been built up to a stabilised industry.

Its time of introduction into Queensland is somewhat obscure: there are, however, records of seedlings over thirty years of age, many of which are still fruiting. In recent years, budwood and grafted trees of promising varieties have been imported from the United States, whilst selections of locally raised seedlings of excellent quality have been made.

Botanical Status.

Botanically, the avocado belongs to the genus Persea, and is a member of the laurel family. The early classification of the avocado

Plate 73.
A Small South Coast Foothills Plantation.

grouped all varieties in one species—*Persea Americana* Mill. There are, however, three ecological or climatic races—Guatemalan, Mexican, and West Indian.

Guatemalan Race.—A highland type, the fruit of which matures during winter and spring and possesses a woody, granular skin of comparative thickness.

Mexican Race.—A highland type, the fruit of which ripens during summer and autumn, is small to medium in size and thin skinned. The strong aniseed aroma given off by the crushed leaves is commonly used for identifying the members of this race.

West Indian.—Tropical lowland type, the fruit summer and autumn maturing, medium in size, with skin of medium thickness and of a leathery texture.

The avocado is an evergreen, though some varieties are virtually leafless for a short period during blossoming. The habit of growth is variable, some trees being tall, upright, and unbranched, while others are small, well branched, and spreading. The leaves also vary considerably in size and shape. The young foliage often exhibits various shades of red and bronze, but when mature is usually deep-green in colour.

The fruits of different varieties vary greatly in size, shape, and colour. In shape they may be round, oval, pear-shaped, or any graduations between these forms. The colour may be bright yellow, green, dark green, maroon, purple to purplish-black.

Plate 74.
YOUNG AVOCADO TREE, "NABAL."

Food Value.

At present the avocado is principally used as a savoury, but as its general food value becomes more appreciated it will undoubtedly find a much larger place in the diet of the general public. In addition to its use as a savoury, its nut-like flavour and creamy consistency has been found to blend with other dishes, such as ice-cream, egg-nog, and salad dressing. These innovations should enjoy popularity when the avocado can be placed on the market in sufficient quantity and at a price within the reach of all.

The vitamin content of the avocado must be considered high, as it is an excellent source of vitamin B. Vitamin A is also high, whilst the vitamins C, D, and F have been noted to be present.

It is high in fat content, protein, and minerals, which suggests that it contains nutriment values far exceeding those of other fresh fruits.

Plate 75.
"Nabal" Avocado Fruiting.

Adaptability to Queensland Conditions.

The commercial culture of the avocado can be carried on within certain limits in our tropical and sub-tropical coastal areas. Trees planted in the foothill districts along the North and South Coast, and in Northern Queensland, have grown vigorously, and some are now in heavy bearing. Whilst at the present juncture large commercial plantings are hardly warranted, smaller plantings as a side line are worthy of every consideration. Its climatic requirements are similar to those of citrus. This, however, can only be taken as a general guide, for in practice it has been found that the avocado is more susceptible to low winter temperatures, and, in addition, during the blossoming period, variable weather conditions, such as changes from fine to wet or from warm to raw and cold, considerably interfere with the normal blossoming. Briefly, the climatic factors limiting its commercial culture in Southern Queensland, and to be guarded against as far as possible, are—

(*a*) Low winter temperatures;
(*b*) High spring and summer temperatures;
(*c*) Low atmospheric humidity during the blossoming and fruit-setting period;
(*d*) Heavy winds.

Soils.

In Queensland, the avocado is thriving on a comparatively wide range of soils. Loams, sandy loams, and sandy soils are all regarded as suitable.

In considering the question of soils, although chemical properties are of importance, suitability largely depends on the physical properties, such as porosity and aeration on which depend good drainage; good depth is also important.

Some of the loams of basaltic origin on the coastal ranges and the sandy loams along the foothills of these are excellent soils for avocados. The more sandy soils, reddish to brown in colour, vary in physical properties. They are often too well drained, especially where they immediately overlie a sub-soil of gravelly wash and, unless they can be well irrigated, are best avoided. However, where the sub-soil at 18 to 30 inches deep is of a heavier nature and a deep red in colour, they should prove suitable. Heavy clay soils and the grey sands found in low-lying areas should be avoided.

The ideal soil for avocados is a loam of medium texture overlying a medium but porous sub-soil which, in turn, overlies a gravelly wash. In no circumstances should trees be planted on poorly-drained soils, as the roots are extremely sensitive, and the trees quickly succumb to "wet feet."

Propagation.

As seedling avocados cannot be relied upon to produce fruit true to type, the planting of trees worked from varieties of known performance is advocated.

Plate 76.
AVOCADO TREE IN BLOSSOM.

Seeds for the propagation of avocado trees should be selected from properly matured fruits from healthy and vigorous seedlings, and should be washed, cleansed, and planted as soon as possible after removal from the fruit. They may, however, be held, if necessary, for several months without apparently impairing germination, providing care is taken to prevent them drying out.

Plate 77.
"Fuerte" Tree.—Note straggling type of growth.

Germination may be induced by planting the seed in tins, seed boxes or seed beds. A mixture of equal parts of clean sand and loam is used. The seeds are placed in the soil with the base down and with the apex just protruding above the surface. The soil should be kept moist but not soaked. During hot weather shading will be necessary; hessian or lath screens are useful for the purpose. Under favourable weather conditions, germination will take place within a few weeks.

When grown in a seed bed, the seedlings should be transplanted to nursery rows upon attaining a height of 6 to 8 inches. When lifting, care should be taken to prevent root damage, because avocado seedlings have a particularly long tap root.

In the nursery row, the plants are set out at 12 to 18 inches apart in the row, and the rows 30 to 36 inches apart. Immediately after planting the seedlings should be watered to prevent wilting. Temporary protection from the sun is necessary; shading on the north-east side is particularly advisable. Frequent waterings are again necessary, but soaking should be avoided.

When the stocks have attained a diameter of about $\frac{3}{8}$ of an inch at their base, and the sap is flowing freely, they may be budded. This is usually done during the autumn or spring, but it may be continued as long as the sap is flowing very freely. When the stock is ready to receive the bud, a "T" cut is made in the bark, preferably 6 to 8 inches above ground level. The perpendicular cut should be from $1\frac{1}{2}$ to 2 inches in length and just through the bark to the cambium layer in depth; damage to the cambium should be avoided. The "T" cut should be made preferably on the south side of the stock, for on that side the bud will not be so exposed to the sun.

Plate 78.
Bud Sticks.

Budwood should be carefully selected from branches of recent growth which have been permitted to mature. The terminal growth should be rejected and either of the two previous growths used. Budding avocados has been found to require rather more care than is required with some other fruits, because, while the union of the stock and scion takes place readily enough, the bud often fails to grow, and the eye falls out. It is necessary, therefore, to select only the plump full buds in the middle of the bud stick. Buds at the top of the stick rarely develop, while those at the base are inclined to shed the eye. If required, budwood may be stored for from four to six weeks by packing it in trays in moist sphagnum or peat moss. Actually, storing is of advantage in as much as buds which may be over-developed are shed and the bud stick may then be rejected.

Before the buds are cut from the bud stick the leaves should be trimmed off, leaving a piece of the leaf stalk or petiole to permit of easier handling after the bud has been cut.

The bud may be cut either from above or below, the general practice being from below the bud upwards, commencing from $\frac{3}{4}$ inch to 1 inch below the bud and ending from $\frac{3}{4}$ inch to 1 inch above it. The cut should be made with a sharp, thin-bladed knife and just deep enough to remove a thin layer of wood. Where the removal of the wood can be done without injury, the chances of a successful union are increased.

The bud is inserted in the "T" cut in the stock and gently pushed down between the bark and the cambium layer. In order to bring the bud and stock into close contact, the two are then bound closely together with raffia. About three weeks are required for the bud to unite with

Plate 79.
BUD INSERTED AND TIED.

Plate 80.
BUD SHOOT SUPPORTED BY TIE.

the stock, and during this period the tie should be inspected frequently, and where bulging appears the tie should be loosened to prevent restriction.

As soon as the union takes place, the stock may be headed back a few inches in order to force the bud into growth. The ties should not be removed from the point of insertion until the bark flaps have entirely healed over, which should take place in from six to eight weeks after budding.

As soon as the bud has made 3 or 4 inches of growth, it should be tied to the stem of the stock and later trained to a stake. The final removal of the stock stub may be done when the bud shoot has reached 12 to 18 inches in length and has become somewhat hardened and capable of remaining erect. The cut is made at a slope just above the union, and should be sealed with some suitable substance such as Bordeaux paste or lime sulphur.

Pollination.

Studies of avocado blossom behaviour in Queensland has adduced evidence similar to that obtained in other avocado-growing countries, and suggests that mixed plantings of certain varieties of different groups are essential to ensure satisfactory cross pollination. These blossom studies have demonstrated that avocado flowers have two distinct opening periods, one during the morning and one during the afternoon; and all varieties observed can, as regards flower-opening periods, be grouped into two classes, which, for convenient reference, have been designated groups "A" and "B."

At the first opening of the flowers, all the stamens are spread out in a nearly flat plane (Plate 81), and the stigma is then receptive. On the second opening the inner whorl of stamens, three in number, are folded about the style (Plate 82). The outer whorl of stamens (six) do not open widely as at their first opening, and do not fold inwards until the pollen has been discharged and the flower is about to close. The time of discharging is indicated by the opening of small lids or valves on the anthers. On the second opening of the flowers, the style appears to have elongated and the stigma is elevated above the anthers. The pollen appears as a sticky mass.

Plate 81.

Avocado Blossom.—First opening period (receptive). Note that stamens are spread out in a flat plane.

Plate 82.

Avocado Blossom.—Second period opening (pollen shedding). Note in whorl stamens folded about style, also small anther lids opened signifying the discharge of pollen.

Observations have shown that the flowers of varieties of group "A" open for the first time in the morning when they are receptive. They close usually between noon and 2 p.m., and open a second time during the afternoon of the following day, when they shed pollen. On occasions, a part of the third day may be required to complete the cycle. The flowers of varieties in group "B" open for the first time in the afternoon when they are receptive, and open a second time the following morning when they shed pollen.

Sudden changes of weather conditions from fine to wet, raw, or cold, upset the normal floral cycle, delaying the flower opening, and restraining the regular functioning of the floral parts. Sometimes up to eighty hours are required to complete a cycle in both "A" and "B" groups.

As has been stated, all the varieties so far studied fall into these two groups ("A" and "B"), shedding their pollen for the most part at different hours of the day; and from this it is probable that varieties selected from these two groups and interplanted will enhance the opportunities for fruit-setting.

So far, the undermentioned varieties growing in Queensland have been studied and placed in the groups "A" and "B":—

Group "A."		Group "B."	
Anaheim	G	Cambelli	H
Benik	G	Fuerte	H
Dickinson	G	Ganter	M
Karlsbad	G	Nabal	G
Mayapan	G	Northropp	M
Princess	G	Panchoy	G
Puebla	M	Queen	G
Spinks	G	Tamborine 68	G
		W.P.I.	M

The letter following the varieties denotes the race; G. Guatemalan, M. Mexican, and H. those considered to be of Hybrid origin.

Varieties.

In selecting varieties for trial plantings, some of the desirable characteristics to be considered are:—

(1) Hardy and vigorous-growing trees.
(2) Regular and heavy croppers.
(3) Uniformity in size and shape of fruit.
(4) Quality of fruit which should be fleshy, free from fibre, and of a rich nutty flavour.
(5) Seeds should be small and tight in the cavity.
(6) Thickness of skin. A thick skin is desirable, although it makes maturity more difficult to determine. Early thin-skinned varieties are susceptible to damage by fruit fly.
(7) Synchronisation of blossom periods of the varieties planted.

Plate 83.
ANAHEIM.

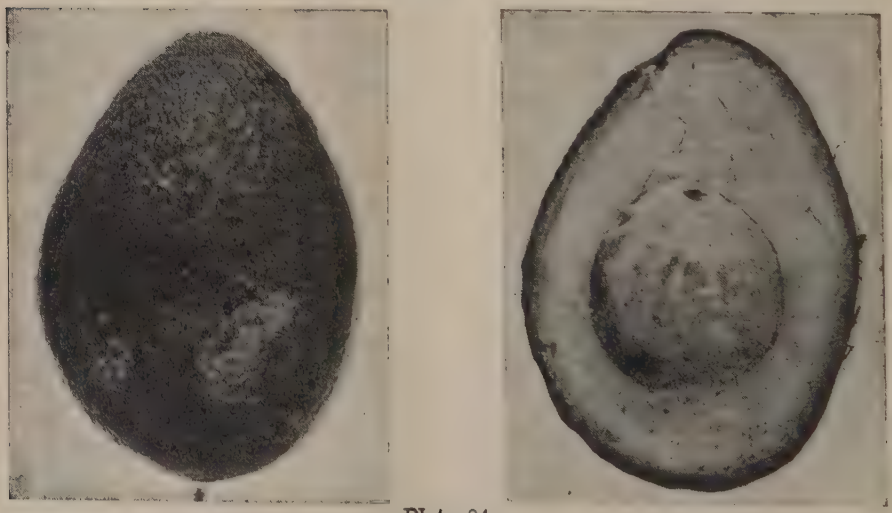


Plate 84.
BENIK.

The study of varieties is as yet far from complete, and it is quite possible that at a later stage new names will be added, whilst some may have to be removed from the following list. In these descriptions allowances should be made for normal variation in the fruits and the season of maturing, which will differ to some extent in different localities.

Anaheim (Guatemalan).—Tree tall with upright growth, blossoms mid-season (September to October), a prolific bearer though the fruit is easily shed; fruit elliptical; skin rough, glossy, green; flesh creamy; flavour good; seed medium size and tight in cavity; matures during July and August; pollination group "A."

Benik (Guatemalan).—Tree spreading, well-branched; blossoms mid-season September and October; fruit pear-shaped; skin inclined to be rough, maroon purple; flesh creamy-yellow; flavour good; quality excellent; seed small and tight in cavity; matures September to October; pollination group "A."

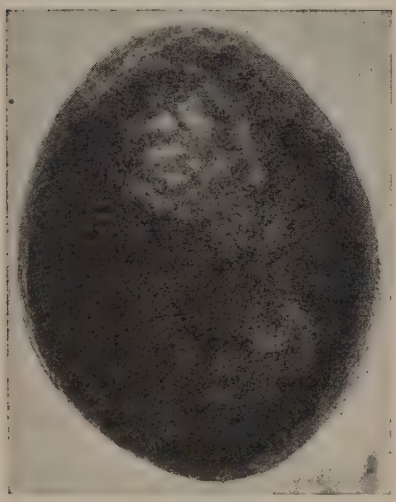


Plate 85.
DICKINSON.

Dickinson (Guatemalan).—Tree well-branched, spreading, blossoms mid-season; fruit oval to pear-shaped, apex rounded, surface roughish; purple; skin thick; flesh buttery, pale yellow, pleasant flavour; good quality; seed roundish flattened at the poles, tight in cavity; matures September and October; pollination group "A."

D.C. 68 (Guatemalan).—A Queensland seedling raised by Messrs. D'Arx and O'Conner, Tamborine Mountain. Tree large, well-branched, blossoms mid-season; fruit pear-shaped, shiny green in colour, the skin medium, smooth granular; flesh pale yellow, buttery texture, slight fibre, flavour good; seed medium, firm in cavity; matures September; pollination group "B."

Fuerte (Hybrid).—Tree straggling, spreading; blossoms very early July and August; fruit pear-shaped, oblong, base somewhat pointed, apex obliquely flattened; green with numerous yellow dots, pebbled; skin thin, pliable, leathery; flesh creamy-yellow, greenish near skin, texture buttery, very rich flavour, quality excellent; seed tight in cavity; matures April and May; pollination group "B."

Mayapan (Guatemalan).—Tree rather upright, well branched; blossoms late October and November; fruit almost round, smooth, dark purple; skin thick, granular; flesh creamy yellow, buttery texture; flavour good; seed rather large, tight in cavity; matures September and October; pollination group "A."

Nabal (Guatemalan).—Tree well-branched, spreading; blossoms late; fruit almost round, smooth, green in colour, skin thick, granular;

flesh creamy-yellow, buttery texture, greenish near skin; flavour exceptionally good; quality excellent; seed small, tight in cavity; matures October and November; pollination group "B."

Queen (Guatemalan).—Tree well-branched, spreading; blossoms late; fruit oblong, pear-shaped; skin rough, deep purple, thick and woody; flesh rich yellow, greenish near the skin; flavour rich, quality good; seed small, tight in cavity; matures October; pollination group "B."

Spinks (Guatemalan).—Tree well-branched, spreading; blossoms late; fruit broadly obovate; surface rough, somewhat warty at the base,

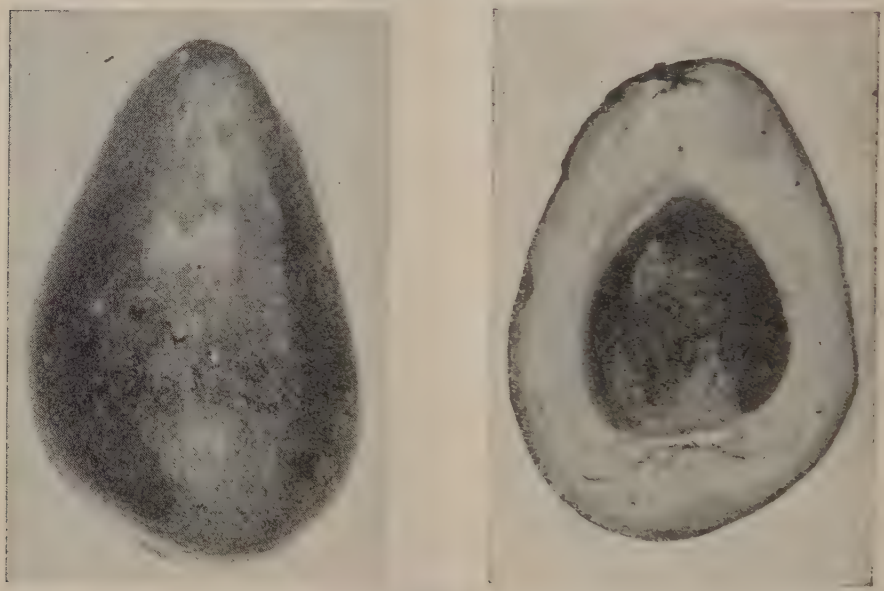


Plate 86.
FUERTE.

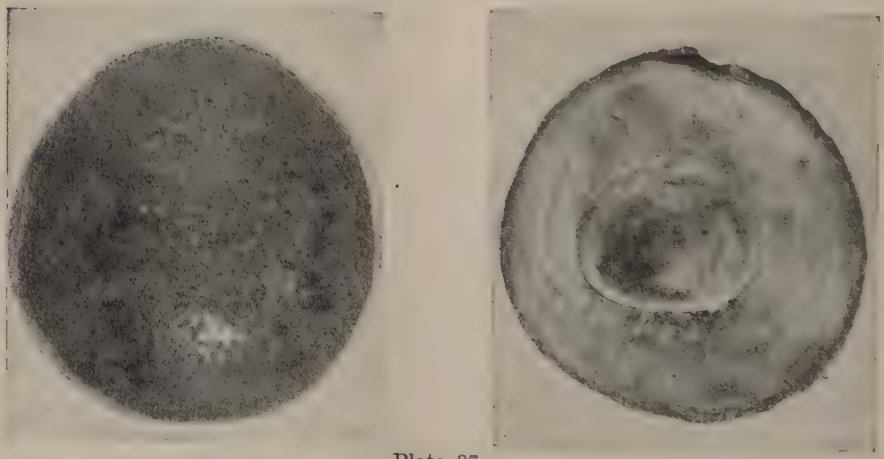


Plate 87.
NABAL.

dark purple; skin thick, woody, granular; flesh firm, smooth, creamy; flavour pleasant, quality good; seed large, tight in cavity; matures October and November; pollination group "A."

Wilsonia (Guatemalan).—A Queensland seedling raised by Mr. J. Wilson, Hunchy; tree well-branched, spreading; blossoms early August and September; fruit oval, dark-green in colour; smooth skin, thick, shell-like, granular, woody; flesh creamy coloured, greenish near skin; flavour good; seed medium large, firm in cavity; matures July and August.

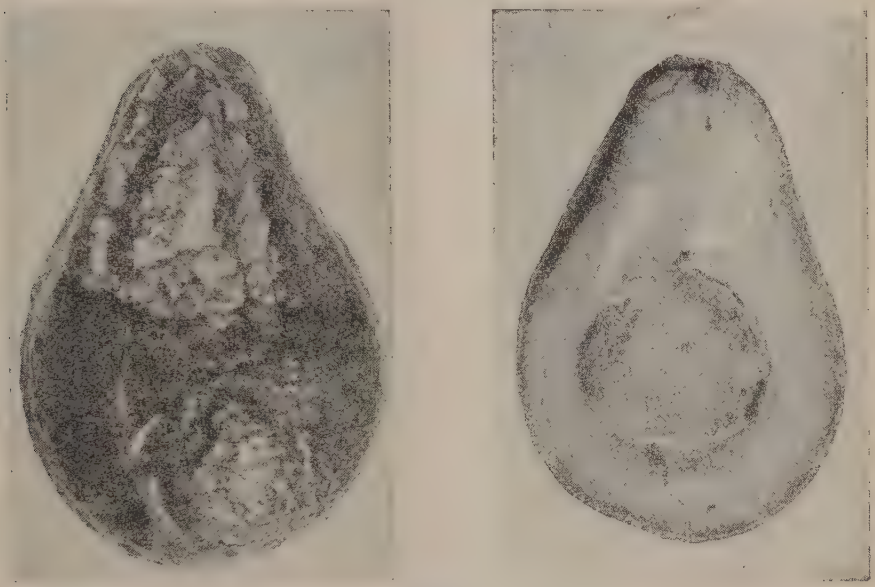


Plate 88.
QUEEN.

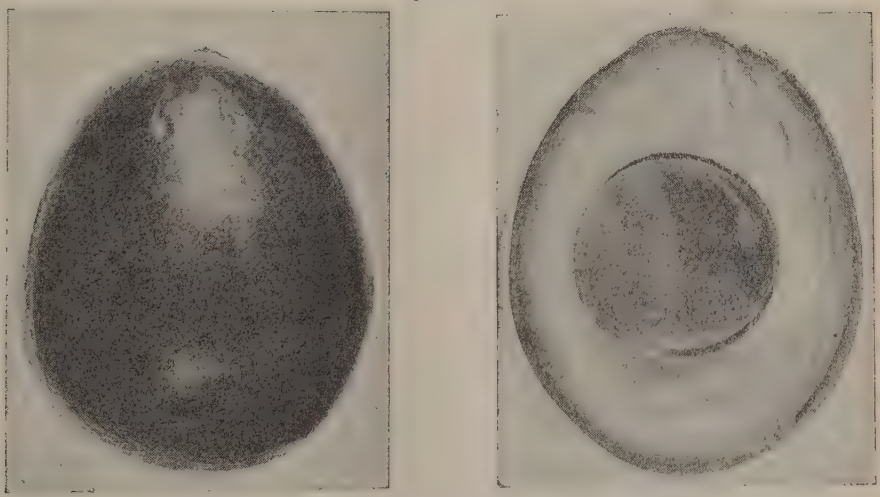


Plate 89.
WILSONIA.

Vegetable Production

Lettuce-growing.

C. N. MORGAN, Fruit Branch.

LETTUCE during the last few years has become one of the major vegetable crops of districts adjacent to Brisbane. Until recent times the main sources of supply were Chinese market gardens which were chiefly situated in low-lying alluvial ground adjacent to swamps or small creeks near the cities and various large towns.

With the increase in demand, growers with reliable irrigation and with various types of soil experimented with small areas until they found methods and varieties to enable them to produce good quality lettuce all the year round.

The introduction of the Imperial strains of lettuce produced by the late Dr. Jagger of the United States Department of Agriculture has done much to establish the industry in this State. They have shown considerable disease resistance and have stood up to the varying climatic conditions much better than the older varieties. The large well-formed heads of these types are particularly popular on the Queensland market.

Climate and Soil.

Generally speaking, lettuce are grown more successfully during the cooler months of the year, and although affected by heavy frosts this condition is rarely a source of worry in the Queensland lettuce producing districts. Under certain conditions, however, it is grown all the year round, the chief factors in the warmer months being reliable and constant irrigation and the use of a suitable variety. During the summer the plants do not produce a distinct heart as they do in the winter, and although the heads are large they would be classed as loose-leaved. In the warmer weather, unless grown quickly, the lettuce will rapidly run to seed. Almost any well-drained soil, providing it is supplied with adequate moisture and plant food, will grow good lettuce. Different methods of growing may be necessary, such as the hilling up of heavy soils to ensure drainage, particularly during the periods of excessive rains.

Manures and Fertilizers.

As lettuce are heavy feeders it is necessary to ensure that the soil is well supplied with plant food. A number of large growers are fortunate enough to have ample supplies of farmyard manure which is particularly suitable for lettuce and aids in the supply of organic matter without which the growing of lettuce is difficult. Unfortunately, the manure is not available for all growers and therefore the use of commercial fertilizers has become extensive.

The main fertilizer used is blood and bone, which is applied to the ground a week or so prior to planting. Although various methods of application are employed a number of successful growers broadcast the fertilizer and plough or cultivate it in. Where rotary hoes are in use they prove a reliable means of incorporating manure or fertilizer with

the soil. Amounts used vary according to soil requirements and usually from ten (10) cwt. to fifteen (15) cwt. per acre has proved sufficient. During growth, top dressing of the growing crop is often necessary and nitrogenous fertilizers are the most satisfactory. Sulphate of ammonia, nitrate of soda or dried blood are all used, depending on the grower's particular fancy. Two applications are usually considered necessary, but in some cases one is sufficient when a heavy base dressing of fertilizer or manure has been used. The first top dressing may be done soon after thinning, and the second a little later, when the plants are nearly half grown. Top dressing should not be done when the plants are hearting or in the summer, when nearing maturity, as it tends to produce loose heads. When applying the top dressing the fertilizer should not be allowed to drop on the leaves as it may mark them, and as a precaution after top dressing it is a good practice to water, to wash off any fertilizer that may have fallen on the leaves. The total amount of top dressing should not exceed four hundred (400) lb. per acre.

Following constant use of sulphate of ammonia and manures, liming of the ground is often necessary but should not be overdone. It is commonly considered that large quantities of lime are required for successful lettuce-growing, but on many types of soil, excessive liming is not of any advantage and may even have a retarding action on growth. However, it is necessary on soils with a highly acid reaction, when good results will follow. Certain cases have been encountered where lettuce on soils of high acidity would not grow and showed many stunted and yellow patches, but when grown on the same soil after liming, have shown considerable improvement. A slightly acid soil is probably the best and, therefore, if growers should be doubtful as to their soil condition, a sample should be sent to this Department, where it will be tested for acidity and the correct amount of lime needed to correct any excess will be advised.

Rotation.

Rotating lettuce with other types of vegetables is advised, but due to the position and extent of the most suitable land this is not always possible.

A number of farmers are constantly growing lettuce on the same ground successfully, with no apparent ill effects. In most such instances, however, these growers have available large quantities of farmyard manure which keeps the soil in good condition, replacing in it the materials, particularly organic matter, which are apt to be depleted. In soils that are at all heavy, constant watering tends to make the soil organisms inactive, and a rotation with a crop not so exacting in its water requirements allows the soil a chance to dry out partially. Rotation is also advisable to aid efficient control of disease. Green manure crops as a means of improving soil condition are recommended, particularly where growers do not use farmyard manure.

Soil Preparation.

All land for lettuce, whether heavy or of a sandy nature, must be thoroughly prepared. Two, and on certain types of soil three, ploughings are necessary, followed by harrowing and cultivating until such time as the soil is in a fine state of tilth. The sandy loams are much easier to prepare than the heavy clay loams. When planting direct into the field it is essential to have the land as level as possible and free of lumps, and this can be brought about by the use of a float. This float (Plates 90 and 91) is easily made out of weather boards approximately

3 feet long nailed across two strong supports, the thick portion of the board overlapping the preceding narrow portion about ¾ inch. The length of the float may be approximately 4 feet and a chain for pulling attached to the front of the supports so that the thick edges of the planks are drawn against the lumps.

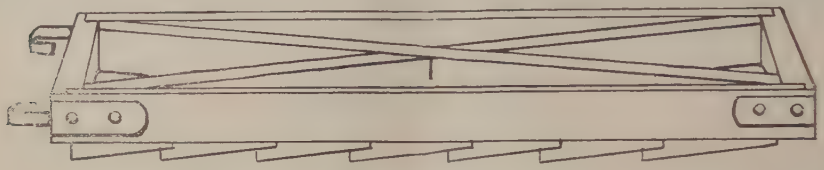


Plate 90.

Wooden Float.—Note placing of weather boards to act as levellers.

Growers may modify the above sizes to suit their particular requirements. With two horses the size may be increased accordingly and should be sufficiently wide to fill in the hoof marks. Diagonal stays help to make the float more rigid. The driver may stand on the float, supplying any additional weight required.

Planting.

Before the general use of small mechanical seed planters and irrigation, it was customary to grow the lettuce seed in beds and transplant to the field. Owing to losses in transplanting and the tedious work this practice has been largely replaced by planting seed direct into the field.

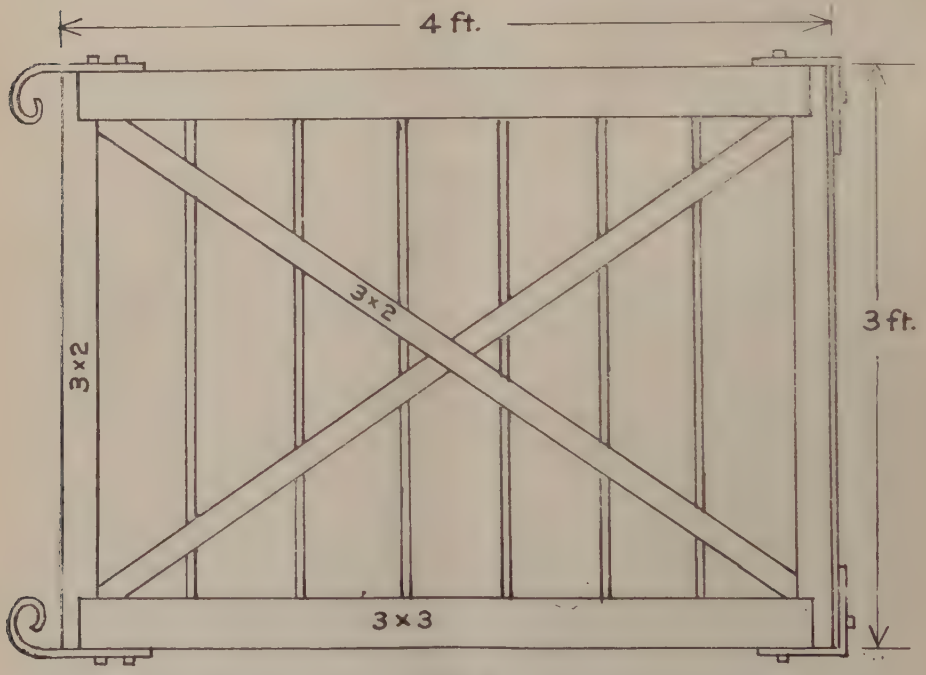


Plate 91.

Top View of Float.—Plan showing method of strengthening.

Plate 92.
SCUFFLER WITH "HILLER" ATTACHED TO REAR FOOT.

Plate 93.
"HILLER" FOR ATTACHING TO SCUFFLER.

Two methods of planting are usually adopted. The first is to plant on to raised beds sufficiently wide to allow four rows approximately 12 inches to 15 inches apart. The method of making the beds is to throw in two furrows approximately 6 feet apart, either by means of a single furrow plough or a hiller attached to a cultivator, as illustrated in Plates 92 and 93. The latter method is simpler and quicker. The beds may then be levelled by raking or by a float. The method of raising the beds is employed on heavy or shallow soils to improve the drainage (Plate 94).

The second system is to plant direct in the field without hilling, and is employed on the well-drained sandy types of soil (Plate 95). Rows are made about 15 inches apart, and this distance allows the use of a hand cultivator. Should horse cultivation be contemplated, which is most unlikely, rows will have to be up to 2 feet apart.

Plate 94.
SOIL HILLED UP READY FOR LEVELLING.

Plate 95.

LETTUCE PLANTED ON THE FLAT.—Recommended only for naturally well-drained soils.

With both methods the seed is drilled out so that it is dropped continuously along the row and must be sown shallow. Thick seeding should be avoided as the work involved in thinning is laborious and expensive and much seed is wasted. From 1 to 1½ lb. of good seed should be sufficient to plant an acre when using a planter (Plate 96),

Plate 96.

MECHANICAL PLANTER.—Controls distance and depth when planting seed, also marks distance apart of rows with adjustable arm projecting from right of machine.

more being required when planting by hand. If there is any doubt of the seed or conditions affecting germination as much as 2 lb. is not excessive. Successive plantings may be done of areas large enough to conveniently handle at periods of approximately seven days apart. Lettuce usually take from eight to ten weeks from seed to reach market condition, depending on the time of the year and climatic conditions.

Plate 97.

THINNING YOUNG LETTUCE WITH A SMALL HOE.—Notice the unthinned row in the centre.

Thinning.

Approximately three to five weeks after planting, depending on location and time of year, the plants should be large enough to thin out. They are usually thinned to about 9 to 10 inches apart. This can be done by hand or with a small hoe (Plate 97). The latter method is effective, and with practice the grower becomes most skilful. Obviously, with the use of the hoe, many small clumps will be left at each required distance and these may then be thinned by hand. Should there be any misses in the row, they may be filled in by some of the thinned plants.

Cultivation.

Cultivation should be fairly constant and in no instance should weeds be allowed to get too big, as the lettuce is a shallow-rooted plant,

and great injury will result in the removal of big weeds. Small hand cultivators may be used to keep down weeds between the rows. In the rows chipping is necessary; if the lettuce are grown quickly, two chippings should be all that is required. One is usually done at thinning and the other a few weeks later. Cultivation should be fairly continuous, but never too deep. During cultivation is usually a satisfactory time for top dressing as the fertilizer is then worked into the soil.

Plate 98.

LETTUCE HALF-GROWN.—Planted 12 inches by 10 inches on raised beds. This area is irrigated with an overhead system.

Irrigation.

Practically all lettuce are irrigated by overhead sprays, and this method is quite satisfactory (Plate 98). If the ground is fairly dry it is advisable to water well a few days prior to sowing. After sowing, the ground should again be watered and then kept moist until the plants are through. Lettuce requires a plentiful supply of water, particularly during the warmer months, when evaporation and transpiration are high. Lack of moisture results in stunting and slow growth of the plants, and in the warmer weather causes them to run to seed prematurely. Soil and climatic conditions have a bearing on any set programmes of watering, and therefore no hard and fast rule can be laid down to cover the various types of soils, but all must be kept moist by regular waterings.

Saturation of soils is undesirable and should be carefully avoided, as far as practicable. This condition often occurs during the rainy periods and irrigation must be carefully planned in an endeavour to avoid watering heavily when heavy rain is likely. During the winter months irrigation is done sparingly, and normally no great effort on the part of the grower is required to keep an even supply of soil moisture during this period. In the summer, however, the position is quite different, and full use of irrigation facilities is necessary.

The well-drained sandy and volcanic soils require much more irrigating than the heavier ones. With the former types it will commonly be necessary to water thoroughly every second or third day. When the longer interval is employed, it will be to advantage to give light waterings in between to keep the soil in as cool a condition as possible. On the heavy soils, one good watering followed by two light waterings each week should be sufficient. Modifications of any programme may be necessary, of course, with any sudden change in climatic conditions, and growers should not blindly follow any particular practice merely because good results followed it in a former season.

Overhead watering during the heat of the day is not recommended and it should be done early in the morning or at night. As the heads reach maturity and the plants spread between the rows they shade the ground and thereby lessen evaporation, with the result that they are not in need of such consistent watering as they were in their earlier stages. Therefore, should a grower find his irrigation supply likely to be slightly below his requirements, losses will be far less probable in lessening the water on the near-mature plants than half-grown ones.

Plate 99.
LETTUCE READY TO HARVEST.

Harvesting.

Lettuce should be harvested as soon as they have reached maturity (Plate 99). If allowed to remain they rapidly become bitter and unpalatable. Winter lettuce are mature when the hearts are firm, and if picked before this do not keep or travel satisfactorily. Summer lettuce, being loose-leaved, may be cut when they reach reasonable market size. In an endeavour to obtain large lettuce in the summer care must be taken to see that they do not start to run to seed, for when this occurs they are commercially valueless. Harvesting extends over a period of days, as it would be a rare case to have all the lettuce from the same planting ready within a day or so of each other. Cutting is done either late in the afternoon of the previous day or early on the

morning of the day of marketing. The former practice is quite satisfactory in the winter, while the latter is more desirable in summer. A pamphlet on lettuce packing for market is procurable on application to this Department.

Varieties.

The most popular varieties are the crisp, curly-leaved lettuce. Various varieties are grown, but the most satisfactory at present are:—

Imperial 847.—This variety is by far the most popular and may be grown in most localities all the year round.

Imperial 615.—This variety is grown to some extent in the winter and is a particularly good lettuce. It is not recommended for the warmer weather.

New York.—This variety is still grown in some localities for the winter, but has been replaced by Imperial 847 for the warmer months.

Seedless.—This variety is popular with a number of growers during the hot months of the year. It is lighter in colour than most of the above varieties but is large and is in good demand.

Mignonette.—A small variety of good flavour, and is recommended for home gardens. It is not a market variety, being too small, but will grow well at any time of the year.

GARDENING REMINDERS.

Green crops already in the ground should be kept growing. Cabbage, lettuce, and silver beet will be more tender for being stimulated by liquid manure. It should be remembered, though, that liquid manure should not be applied if the soil is dry. The soil should be well watered first and the liquid manure given afterwards.

Pumpkins and marrows may take up too much space in a small garden, but if there is plenty of ground they should certainly be grown. They are easy to grow, and the vines may be trained to advantage over a low fence. The pumpkin and its relations like a rich soil, so plenty of animal manure may be dug into the bed. Two or three vines will produce all the pumpkins an average household would use. The fruit should be allowed to ripen on the vine, and if picked when properly ripe they may be stored for a long time. Queensland Blue is a good variety.

When watering the vegetable garden it should be remembered that one soaking every week is better than a sprinkle of spray every day. Shallow watering is often a waste of water, as soil surface evaporation is very rapid, and the roots of the plants get little or no moisture at all. What garden soil requires is a good wetting, even down to the depth of a foot, as most plant roots go down so far, and some may even penetrate further.

PLANT PROTECTION

The Value of Bird Life on the Farm.

HUBERT JARVIS, Research Officer.

MANY farmers fully appreciate the importance of bird life on their properties and accurately assess the part which the more commonly encountered species play in the control of insect pests. Unfortunately, however, others sometimes judge individual species of birds by their more conspicuous behaviour which earns praise or condemnation not always justified by a careful survey of their feeding habits. This may explain the endless disputes in rural circles as to the value of birds to the farmer.

In order to settle such controversies and to obtain an accurate estimate of their value, the feeding habits of a considerable number of birds have been studied in detail. This is not a difficult matter, for an examination of the stomach contents of a reasonably large number of individuals in each species gives a good indication of its food preferences and also suggests when and how, if at all, it may be prejudicial to the farmer's interests.

Plate 100.
TERNS IN FLIGHT.
[Published by permission of the Queensland Government Tourist Bureau.

Many birds feed almost entirely on insects, others on seeds, some on fruit and nectar, and a few on carrion. Not many are restricted to a single article of diet and, if the preferred food is not available or is in short supply, they may display unusual feeding habits. Some of their depredations on the farm and in the orchards are due to this cause. Again, the type of crop grown on the farm often supplies large quantities of cereals or fruit similar to the native foods to which the bird is accustomed, and it is not surprising therefore that crops are sometimes attacked. A number of birds also show undesirable habits which bear little or no apparent relation to their feeding and nesting requirements.

The following brief review of some common birds will indicate their varied feeding habits and also their importance to the farming community.

Feeding Habits of Native Birds.

Of the three species of **ibis** in Queensland, the commonest is the straw-necked ibis, so-called from the long, straw-coloured plumes which flank the white neck. Large numbers occur in coastal and inland swamps where breeding takes place and from which they fan out in all directions seeking food wherever it can be found. The long, downwardly-pointed bill is particularly suited to foraging in the ground for white grubs and other subterranean insects, and the typical "auger" holes made when the bill is inserted into the ground are

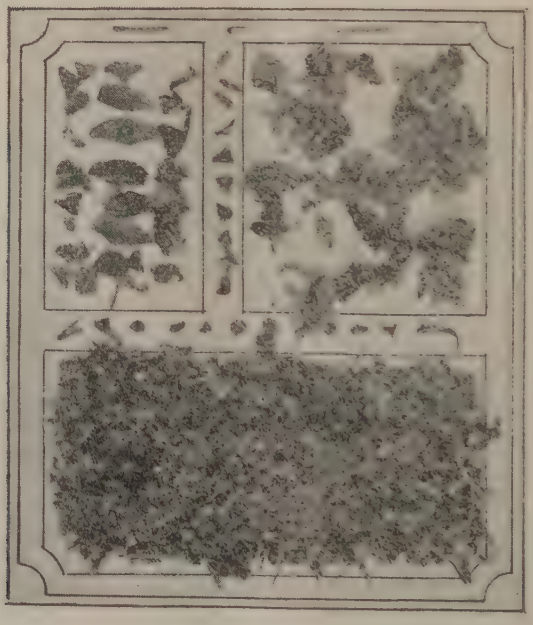


Plate 101.
STOMACH CONTENTS OF IBIS.—Dragon fly larvæ and water bugs.

well known in volcanic, red soils where white grubs are sometimes a serious pest of pastures. The diet includes a variety of other insects however, these being chiefly of the type which tends to aggregate in swarms. Grasshoppers and army-worms thus provide part of the

diet, so much so that the whereabouts of these insects can often be determined by merely noting the paddock or part of a paddock in which ibis congregate from day to day.

The **frogmouth** with its very wide gape, from which comes the name, is a large, dark, sombre-looking bird whose colour matches the dead branch usually selected as a perch. Somewhat owl-like in appearance, it also resembles this bird in its night-feeding habit, though, unlike the owl, it feeds almost entirely on insects. These include the large cicadas whose shrill chirrup deafens the ear in the gum-covered country where they occur, phasmids—long, grotesque-shaped insects with flattened, leaf-shaped limbs—and the large scarabæid beetles which congregate in great numbers in the vicinity of trees after spring storms.

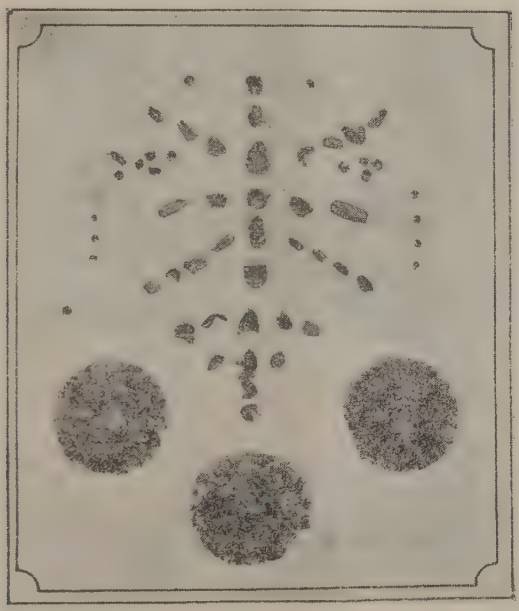


Plate 102.
STOMACH CONTENTS OF MAGPIE LARK.—Beetles, ants, and small seeds.

The **magpie lark**, known from its characteristic shrill cry as the "pee wee," is a moderate-sized, black and white bird often seen in recently ploughed land searching for white grubs, wireworms, the pupæ of cutworms and army-worms, and other insects. It is also credited with an appetite for the small snails in which the organism responsible for liver fluke in sheep spends part of its life. Though occasionally feeding on broadcast grain in and near fowl runs, it seldom, if ever, attacks field crops.

The **flycatchers** include a number of very active, fan-tailed birds with a sober-coloured plumage. The two best known are the restless flycatcher, commonly termed the "scissor grinder" from the noise made when it is hovering in the air, and the brown flycatcher, frequently given the colloquial name, "Jacky Winter." All the flycatchers have similar feeding habits and subsist almost entirely on insects. These are mainly flies and small beetles which fall easy victims

to their rapid, yet well-controlled, feeding flight. This is seen to advantage in the Willie Wagtail, so often perched on cattle, from which it darts to and fro to capture bush flies, stable flies, and March flies.

Plate 103.
STOMACH CONTENTS OF FLYCATCHER.—Beetles, ants, flies, and cicada.

Woodswallows, though not real swallows, derive their name from the typical, swallow-like flight which is frequently seen near the edges of clearings and over the tops of trees. Some species are migrants and only visit Queensland during the summer months. All are insectivorous and capture wasps, bees, and similar insects on the wing. Unfortunately, they sometimes nest near an apiary and attack the bees as they enter and leave the hive. In a short time they can seriously weaken the strength of the colony and, as the honey production from the hives is determined by the number of worker bees available to collect nectar and pollen, they may cause considerable loss to the beekeeper. Another bird with very similar habits is the familiar bee-eater known to most apiarists in the Eastern States.

The **cuckoo shrikes** and related caterpillar eaters are all insectivorous, the latter being the more familiar because their pugnacious habits so often attract attention during the mating season. Though shy, they are not infrequently seen in fields where cultural operations are in progress. They are not restricted to white grubs and other insects in the soil, however, for grasshoppers and army-worms form an important part of their diet.

A variety of small birds occurs in shrubby timber along the banks of creeks and among leafy saplings in open, forest country. They include the **thornbills,** the **babblers,** the **tits,** the **wrens,** the **finches,** and the **robins.** Normally hunting in pairs or small groups, they seldom fly far from the nest and are typical of the vast number of

midgets in the bird world which feed almost entirely on insects. Each has its preferences. Some seek out aphids, others favour scale insects, while small caterpillars are destroyed by most of them. It is probable that the absence of these birds from some built-up areas in the city is one contributory cause to the heavy scale infestation in shade trees and ornamental shrubs.

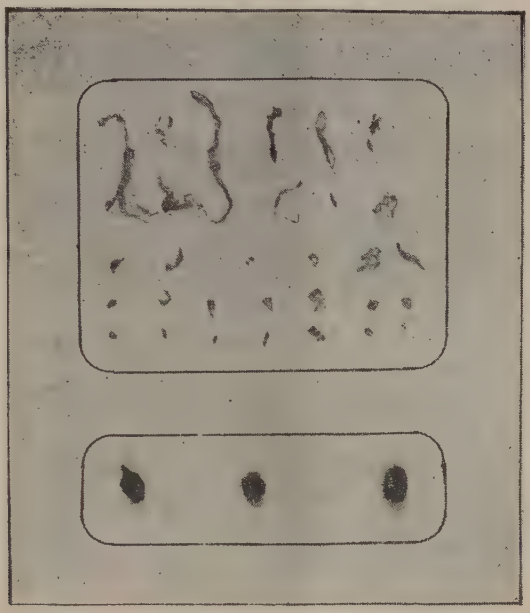


Plate 104.
STOMACH CONTENTS OF CATERPILLAR EATER.—Caterpillars, crickets, cicadas, and odd seeds.

The commonest of the true **owls** is the Boobook or mopoke whose eerie hoot can be heard almost anywhere in the bush at night. Like all owls, it has an aloof, cadaverous appearance quite in keeping with its nightly habit of preying on small birds, mice, and some of the larger insects. The insects include grasshoppers and several large beetles, some of which are of interest to the farmer as occasional pests of field crops and shade trees.

Crows, currawongs, and **magpies** are large, black or black and white birds found in forest country which is fairly well covered with timber. Crows feed mainly on insects, but they are also partial to carrion and occasionally to grain. They are particularly valuable in pastoral areas on account of their scavenging habits, though they sometimes attack the eyes of aged sheep and weak lambs, and are then a nuisance to the grazier. In agricultural areas they may invade grain crops, but seldom on a scale beyond the farmer's power to deal with it. The currawong moves about in small groups though these may merge and become fairly large colonies when food supplies are abundant in the one place as, for example, when the larger grasshoppers invade subcoastal and pastoral areas. Other insects in their diet are wasps, ants, and beetles. Native fruits are also consumed, and at times the currawong may be troublesome in orchards when the fruit is ripening.

The magpie tends to be more solitary than the currawong, and is perhaps best known for its pointless habit of uprooting seedlings both in the field and in the nursery. The vice has no obvious connection with the search for food.

Plate 105.
STOMACH CONTENTS OF CURRAWONG.—Beetles, ants, wasps, snail, and vegetable matter.

The **hawks** and the related talon-footed birds of prey are well represented on the farm by the common brown hawk and the Nankeen kestrel. They prefer a varied diet containing insects such as cicadas and grasshoppers, small birds, rodents, marsupials and lizards. Owing to the acquired habit of attacking and carrying off chickens from unprotected fowl runs, the brown hawk has a bad reputation. Actually, however, insects and rodents which are undesirable on the farm provide the bulk of its food.

Parrots, cockatoos, galahs, and **parrakeets** include some of the most useful as well as some of the most destructive birds found on the farm. The black cockatoo is usually restricted to scrub or rain-forest areas where it occurs in small flocks which feed on the larger borers found in dead and dying trees. To get at these insects, the bark is stripped and torn aside by the powerful beak. The white cockatoo is fond of grain and in some parts of the State raids maize paddocks when the crop is maturing. It is very shy and not easily lured within gun range. Some galahs are also very partial to grain crops and present a troublesome problem in grain sorgnum areas, particularly where the area planted is small and their feeding is therefore not dispersed over a considerable acreage.

The **kingfishers** are, for the most part, vivacious birds with a highly-coloured plumage. Most of them occur in the vicinity of water, but they range far afield in search of food. The best-known member

of the group is the kookaburra, which is commonly found in open forest country. Though fond of insects such as white grubs, weevils, and grasshoppers, they also eat lizards, small snakes, and mice.

Honey eaters are small, slender, and often brilliantly-coloured birds which abound in flowering eucalypts, tea trees, and Banksias. Though feeding primarily on nectar and pollen, they capture large numbers of the smaller insects associated with the flowers such as ants, bees, wasps, and flies. Occasionally they also attack the softer, cultivated fruits.

Plate 106.
STOMACH CONTENTS OF KOOKABURRA.—Cicadas, ants, spiders, and beetles.

Feeding Habits of Introduced Birds.

The **sparrow** has spread widely throughout Australia since it was first introduced to this continent. It increases rapidly, perhaps because its food requirements are met by a wide range of insects, seeds, domestic scraps, and fruit. White ants, cabbage moths, blow-flies, and aphids are among the principal insects caught by it, but, to counter its usefulness in this way, are the damage done when flocks feed on germinating grain crops and its well-known habit of snipping off the tops of young vegetables. Nests in the eaves of buildings are also a nuisance, not only through blockages caused to spouting, but also because innumerable bird mites frequently invade dwellings when the nests are vacated.

The **starling,** another introduced bird, feeds on a wide variety of insects, including ants, grasshoppers, and cutworms. Ticks are also relished, and a flock may settle on resting cattle to feed on these pests. Nevertheless, the starling must be considered injurious for it does a great deal of damage to grain and fruit crops, particularly during a dry season when alternative food supplies are scarce. Like

the sparrow, the starling is very aggressive and tends to oust useful native birds from areas where their presence is very desirable.

A third introduced bird, the **Indian mynah**, is related to the starling and at one time held promise of being a useful predator on ticks. Unfortunately, it seldom flies far from residential areas and has therefore made little, if any, contribution to the solution of the tick problem.

Effect of Bird Life on Insect Pest Outbreaks.

From the foregoing outline of the feeding habits of the better known birds, there can be little doubt that insects are the staple food of most of them, and it is therefore necessary to determine what contribution they make to the prevention of pest outbreaks. Insect outbreaks are determined by a number of factors, the balance between which decides whether or no they will occur. These factors include weather conditions which may be favourable or unfavourable for the insect, the amount and suitability of the available food supply which set limits to the numerical increase which may be possible, and parasites which, with the aid of predators, destroy the pest with varying degrees of efficiency. Birds are important predators on insect pests and unlike most of the insects on which they feed they have a relatively slow rate of breeding. Hence, unless they move into an area in large numbers during the early stages of an outbreak of an insect pest, they can do little to stop an attack on crops and pastures. They may, however, slow down the rate at which the insect population increases and, with the assistance of parasites and other predators, shorten the duration of an outbreak. It would appear, therefore, that the most useful birds are those which forage for food over fairly large tracts of country and they will be most effective when the outbreak is merely local in its incidence. Some pests, e.g., grasshoppers, congregate in swarms before they become important, and it is probable that by attacking such aggregates of insects, birds do lessen the chances of a major outbreak. Proof is, however, difficult to obtain.

While admitting the value of most birds in controlling insect pest populations, it may be argued that the damage caused to crops by some, the nuisance value of a few, together with the fact that even purely insectivorous birds seldom discriminate between beneficial and injurious insects, offset any material gain to the farmer. The number of birds with disreputable habits is, however, such a small proportion of the whole bird fauna that indifference to the preservation to bird life is quite unjustifiable. Birds have in no case prejudiced the establishment of an industry or have ever been responsible for more than negligible losses to the farming community as a whole. Hence, the rural balance-sheet must show a considerable credit on the side of birds though its amount will always be a debatable subject. The mere existence of such a credit necessitates a discussion of the methods by which the æsthetic charm and considerable utility of bird life can be preserved and, if possible, made available to the community.

Protection of Bird Life.

Most progressive communities have prepared and put into effect legislation which aims at the protection of at least the more useful birds. All such legislation is based on some kind of classification, determined after reviewing the feeding and other habits of the almost innumerable species with which it deals. Some are protected because of their rarity,

and others because they are useful or harmless. A few receive no protection because they are a menace to the farmer. The destruction of some birds is a criminal offence at any time of the year; others cannot be destroyed during the main breeding season.

The protection of certain birds by simply prohibiting their destruction altogether or during specified seasons does not, however, go far enough. Rural development, particularly in coastal areas, often proceeds with little or no appreciation of its effect on bird life, and some more or less unique and typically Australian birds are now so rare that few people have ever seen them. This is largely due to the destruction of their timbered haunts following the impact of settlement. Recent legislation has taken cognisance of this fact and sanctuaries have been created where birds and other forms of wild life can live unmolested in their natural surroundings. These sanctuaries serve a double purpose; they give wild life the opportunity to survive and also enable the community to see the country in its original form.

In Queensland, such legislation as "*The Fauna Protection Act of* 1937," aims, among other things, at the preservation of the more useful birds and has, consequently, a considerable bearing on both the numbers and species found on the farm. Farmers have therefore a duty to both themselves and the community to see that the intent of the legislation is not nullified by vandalism, no matter whether it is due to ignorance of the law or malicious habits in the individual.

HANDBOOK FOR QUEENSLAND FARMERS.

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Readers are notified that VOLUME III.—INSECT PESTS AND PLANT DISEASES, and VOLUME IV.—SUGAR CANE AND ITS CULTURE—are now out of print.

Volumes of the **Queensland Agricultural and Pastoral Handbook** Series still available are—

VOLUME I.—FARM CROPS AND PASTURES (5s., post free);

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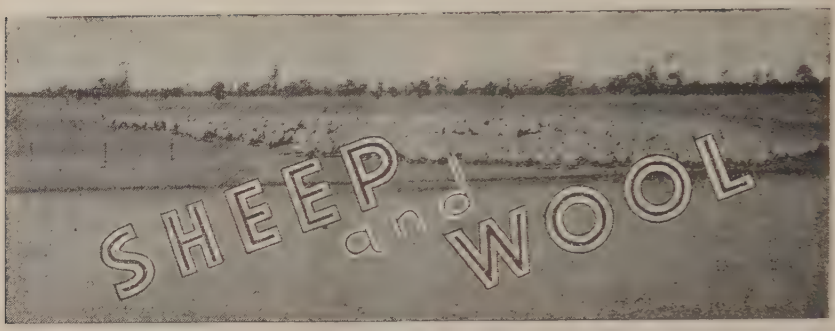
Both volumes are obtainable from the Under Secretary, Department of Agriculture and Stock, Brisbane.



Grazing Selection Improvements.

J. L. HODGE, Instructor in Sheep and Wool.

PROPER expenditure on necessary improvements on the grazing selection is most important. Under our land laws the selector is responsible for an amount, assessed by the Land Court, for existing improvements. It will therefore be readily understood that necessary improvements on some areas will be greater than on other areas of the same extent, this difference being dependent on existing improvements. For the purpose of this article, it is proposed to take an area of land quite bare, so that all necessary improvements may be touched on. Where capital is available it is an easy matter for the selector to inadvertently over-capitalise a grazing area. Therefore it should be of first importance to estimate the cost of all improvements with the idea of comparing the result, plus the value of the land, with the known value of surrounding properties. The value of an improved selection is judged by what it will reasonably produce annually, capitalised.

Water.

No land can be occupied without a water-supply. If there is a natural supply, so much the better. If not, provision has to be made. This may entail extension of existing bore drains, the sinking of a well or a sub-bore, or the provision of earth tanks. The choice of these should be entirely governed by existing conditions, and the success or otherwise of water projects in the surrounding country. If it is possible to arrange for the extension of existing bore water supplies that should be done. If water is to be got at reasonable depth and at a reasonable price by sinking a sub-bore, it also should be done. In country where underground supplies have proved too deep and costly, or salty when tapped, recourse may be had to surface water conserved in earth tanks. In this connection, the point is stressed that small tanks are a waste of money. It has been frequently observed on a selection that although ample money had been spent on surface water in the first dry spell the land is waterless. This is the result of sinking several "pot holes" excavating small tanks instead of spending the money available on one assured supply.

On a small selection, such as is now under discussion, a main water supply, centrally situated, ensures that sheep do not have too far to walk. Therefore, it is wiser to provide for a water supply and then

consider sub-divisions, and not, as is frequently done, fence the country into paddocks and then put an inadequate "pot hole" in each.

The Homestead.

The homestead should be as good as is consistent with the capital value of the property. Circumstances alter cases in this matter of a suitable dwelling, particularly if the family is large. The ground plan of a house, not too costly, is illustrated.

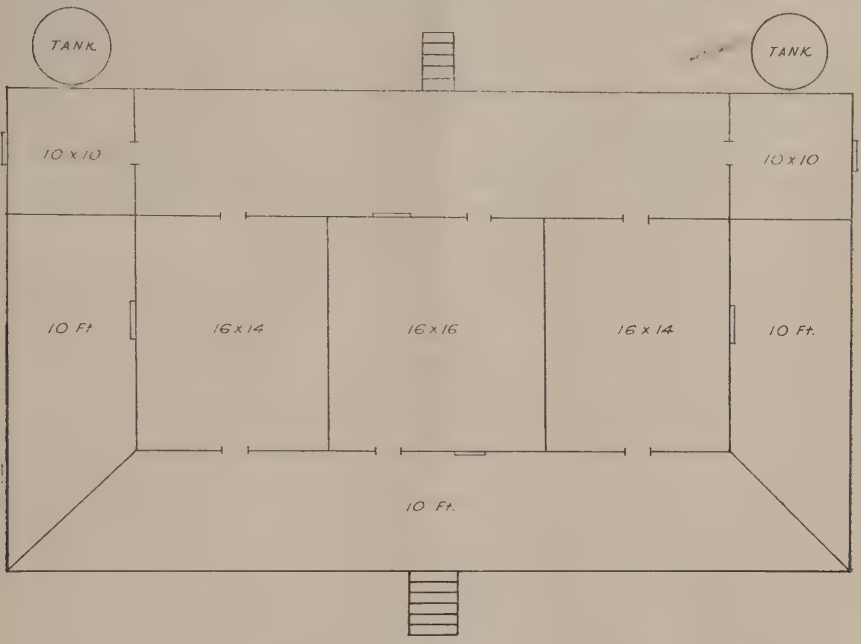


Plate 107.
GROUND PLAN FOR A GRAZING SELECTION HOMESTEAD.

The Horse Paddock.

Before erecting any line of fence a horse paddock should be provided. On new country too much time is lost hunting horses and house cows. Consideration of the site is important. Some think a corner of the property saves two sides of fencing. On the other hand, a horse paddock centrally situated saves miles of horse work in a year, and the subdivision fences attached to the horse paddock save just as much fencing as the paddock in a corner. The horse paddock should be large enough to run all the working horses and house cows comfortably, and perhaps a few rams or ration sheep.

A six-wire fence is recommended. A five-wire fence is ample to hold horses and cattle, but while on the job it is just as well to be sure of rams and killers.

Yards.

Good, substantial yards should be built on a convenient site to serve the double purpose of accommodating the milkers as well as the horses. If the two bottom rails are kept low enough, rams and killing

sheep may also be yarded without risk of their getting through. As to gates, let it be urged that all gates on the property be properly constructed and swung. Make-shifts never pay, and, in many cases, when commenced with, remain for years to the discomfort and irritation of all concerned, to say nothing of daily loss of time in opening and shutting them.

The Boundary Fence.

It is assumed that it is necessary to rabbit- and dog-net the boundary fence. In normal times, generous provision is made by the Department of Public Lands in respect of the procuring of dog and rabbit netting. Fencing timber should be considered and the choice, if there is a choice, should be made of that timber most useful for its longevity in the surrounding district. Split pine, split ironbark, or round sandalwood are all good fencing materials. With sandalwood, the post should not be less than 4 inches at the small end. It is considered a comparative waste of money to erect a dog- and rabbit-proof fence less than 6 feet high. If funds permit, it is advisable to run a top barbed wire.

Strainer posts should be at least 2 feet 6 inches in the ground and well strutted. Strains may be 6 chains with fencing posts 12 feet apart. Every fourth post should be a high post for the purpose of carrying the top netting. All posts should be sunk to a depth of 20 inches. The rabbit netting should be trenched and buried to a depth of 6 inches and well rammed. The most satisfactory wire for the top netting is 12½-gauge steel wire. It is a good plan when using this wire to attach a couple of feet of thicker, softer wire at strainer posts. This permits frequent breaking when the 12½-gauge steel wire is in use. The netting should be made as rigid as possible. Four plain wires are necessary in a fence of this description—the first wire 6 inches above the ground, the second in the middle of the rabbit netting, the third 3 feet from the ground (at the top of the rabbit netting), and the fourth wire 6 feet from the ground and carrying the top or dog netting. Care should be taken when crossing watercourses with a netting fence. Flood gates may be constructed, or a flap of netting attached, well sunken in the ground, and so hooked that flood waters will force this flap down and pass over without greatly damaging the fence. Generally, the greater number of subdivision fences of sheep paddocks the better. However, the economic division of the area will be greatly influenced by the water supply. In every paddock access to water should be provided and the fence lines should be as short as practicable accordingly. Again, a six-wire fence is advised, and the fencing timber may be similar to that of the boundary netting fence. Thought should be given to the placing of gates in subdivision fences with the object of obviating the driving of stock distances greater than necessary.

Ringbarking.

Ringbarking is necessary in timbered areas to bring the country to a payable carrying capacity. The country to be ringbarked should be chosen intelligently. Too often country is unwisely rung in a face. Apart from commercially valuable timber, all good shade trees should be left. Windbreaks across a paddock at regular intervals are valuable for shade and shelter. Timber fringing waterways for some distance on both sides should not be rung.

There are two regular methods of ringbarking—collar-ringing and frilling. Collar-ringing, usually applied to big timber, consists of a double cut entirely releasing a strip of bark from the tree. Frilling, which is usually applied to smaller trees, is done by a cut through the bark and into the sapwood with a pressure of the axe outwards for the purpose of leaving the "frill." With frilling, great care should be taken to see that the cuts overlap so that the severance of the bark is complete. The cost of ringbarking depends entirely on the class of country and may range from 1s. an acre to 6s. an acre, according to the density of the forest in the area chosen.

Drafting Yards.

Sheep-drafting yards are one of the most important of improvements. Therefore, it is well to make a good job as soon as practicable. On a small selection it is an advantage to have the drafting yards erected in connection with the shearing shed. If that is done, provision should be made for a ramp from the yards for the purpose of filling the shed.

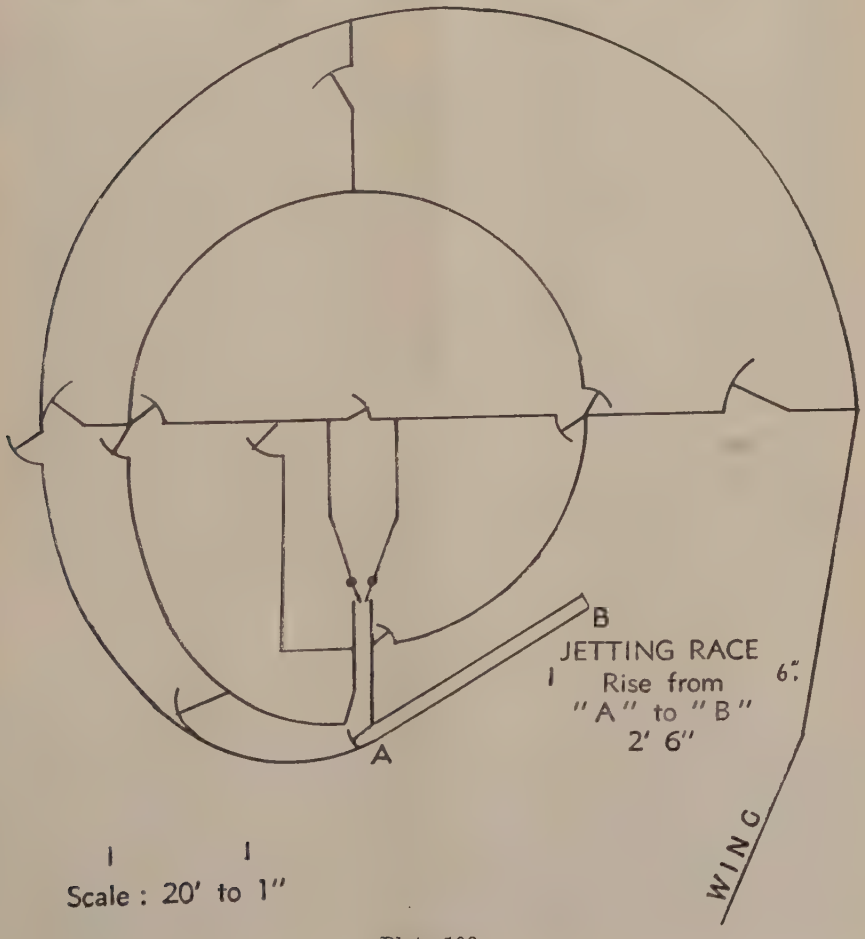


Plate 108.

The "bugle" plan for a set of yards, as illustrated, will be found to have many advantages. Where the timber is available, these yards are comparatively cheap to construct and are adapted especially to the handy working of sheep in times when labour is scarce.

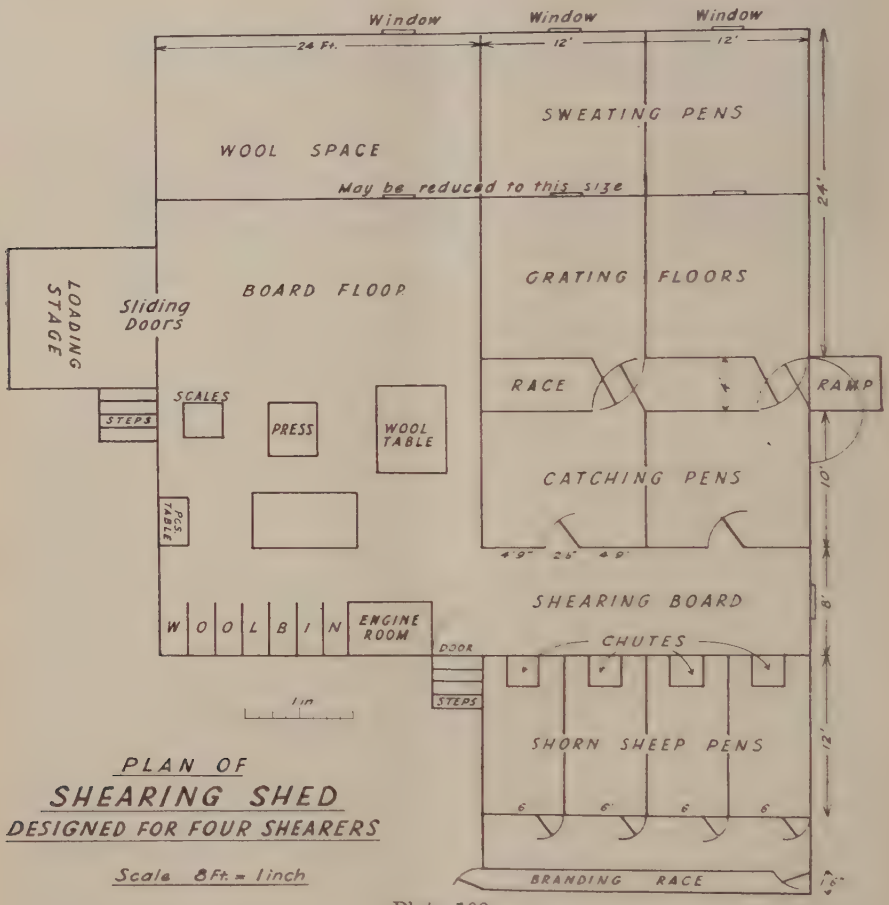
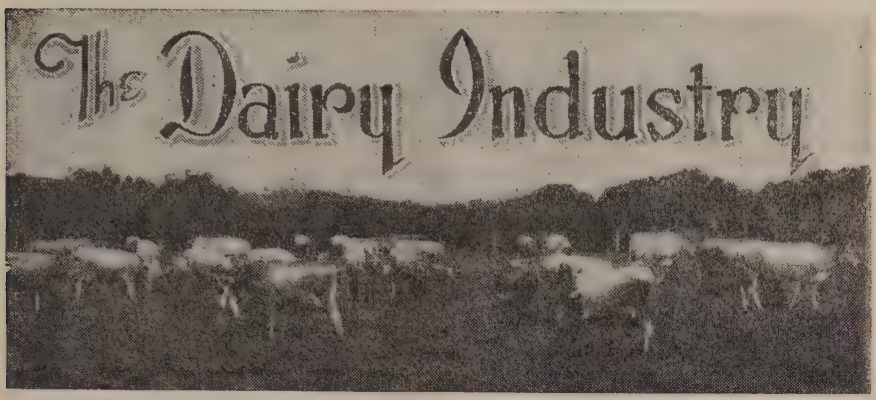


Plate 109.

The Shearing Shed.

In size and accommodation for men and sheep the shed should be based on the carrying capacity of the property. When it is considered that, in all probability, a shed is used only once a year it is a capital cost and care should be taken in estimating the cost. Whatever the size required, the shed should be solidly constructed and every gadget thought of to facilitate shearing operations. The plan illustrated is of a four-stand shed. It will be observed that the shed may be made larger or smaller without greatly interfering with the general plan. In a shed of this kind the average weekly cut, given fine weather, should be about 2,000 sheep.



Queensland Cheese Production.

E. B. RICE, Director of Dairying.

QUEENSLAND cheese production of 12,724 tons for the year 1942-1943 constituted a State record, and far exceeded the previous year's production of 7,299 tons which was then a record. Incidentally, Queensland was the largest cheese producer of the States in the year under review, a position not held since 1934-35, and the gross value of output exceeded £1,000,000 for the first time in the State's history. The effect of the diversion to cheese production, commenced in 1940-41, and of the legislative enactment of 1941 compelling suppliers in gazetted milk areas surrounding cheese factories to supply such factories was only fully apparent in the year just concluded. The stepping up of production in a period of two years to almost treble the pre-war level is an accomplishment of which the industry can justifiably feel proud. While hostilities continue and for some few years thereafter there appears to be a ready market for all the cheese which Queensland can produce.

Despite the huge increase in production in recent years quality has been well maintained. 22,344,785 lb. or 80·58 per cent. of the year's total output, was officially graded. The comparative gradings for 1942-43 and 1941-42 were:—

Grade.	1942-43. Per cent.	1941-42. Per cent.
Choice and first	73.17	72.83
Second	26.32	25.63
Third	.51	1.54

The marked improvement in cheese quality in the past few years may be regarded as a most satisfactory sequel to the campaign for the rehabilitation of the cheese industry, initiated in 1938 and since then actively pursued by the co-operation of the industry and the Department. Special praise is due to the new factories erected in response to the cheese expansion drive for the consistently satisfactory quality of their produce. The results undoubtedly justify the Departmental policy of insisting upon substantial and well-equipped factories and not permitting manufacture in temporary structures without adequate equipment.

SUMMARY OF OPERATIONS OF QUEENSLAND CHEESE FACTORIES, 1942-43.

Factory.	Milk Received.	Cheese, Green Weight.	Butterfat.	Cheese Yields.		Average Test.	Gradings of Cheese.				
				Per 100 Lb. Milk.	Per Lb. Butterfat.		Total Submitted.	Choice.	First.	Second.	Third.
	Lb.	Lb.	Lb.	Per Cent.	Per Cent.	Per Cent.	Lb.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Aubigny	2,624,320	273,917	97,228	10·43	2·81	3·704	281,701	..	91·3	8·7	..
Biddeston	8,536,284	922,045	321,230	10·801	2·87	3·76	823,408	3·0	96·4	0·6	..
Chinchilla	5,066,317	512,073	190,870	10·107	2·68	3·76	515,132	1·8	88·8	9·1	0·3
Coalstoun Lakes	2,316,179	241,216	89,293	10·41	2·701	3·85	111,634	..	1·8	92·2	6·0
Daredale	3,308,936	323,846	122,569	9·78	2·64	3·704	327,877	..	75·0	25·0	..
Downs, Boodua	3,077,530	330,792	125,020	10·74	2·64	4·06	234,558	..	68·2	30·2	1·6
Downs, Toowoomba	6,743,022	678,696	264,049	10·06	2·57	3·91	403,730	..	70·9	27·3	1·8
Dundarrah	1,710,726	167,868	63,801	9·81	2·63	3·72	25,241	..	..	100·0	..
Felton	7,094,204	774,409	279,494	10·91	2·77	3·93	534,117	..	41·3	57·7	1·0
Greenmount	3,638,603	395,219	138,472	10·86	2·85	3·8	293,070	..	45·2	54·8	..
Highgrove	2,660,876	279,267	106,177	10·49	2·63	3·99	238,638	..	7·3	84·4	8·3
Hoopert, Closed April, 1943	2,399,763	263,160	95,272	10·96	2·76	3·97	277,839	..	81·9	18·1	..
Irongate	5,391,045	580,856	199,198	10·77	2·91	3·69	572,260	1·2	92·1	6·7	..
Kooroongarra	6,703,312	685,882	247,031	10·23	2·77	3·68	713,511	4·0	91·4	4·6	..
Lilyvale	3,433,911	365,585	132,458	10·64	2·76	3·85	365,977	..	81·6	18·4	..
Malling	5,970,007	597,617	225,322	10·02	2·65	3·77	116,954	..	5·5	94·5	..
Maclagan, Maclagan	9,948,977	1,031,900	371,289	10·37	2·77	3·73	1,036,704	..	30·3	68·2	1·5
Maclagan, Kulpi	8,835,222	900,280	330,658	10·18	2·72	3·74	876,893	..	78·2	21·7	0·1
Maryborough, Kingaroy	5,808,102	551,959	222,496	9·5	2·48	3·83	162,942	..	85·5	14·5	..
Tansey	2,888,072	283,535	116,562	9·85	2·43	4·0	201,093	0·8	98·8	0·4	..
Wondai	5,077,371	514,634	195,223	10·13	2·63	3·84	134,405	..	91·1	8·9	..
Maxam	7,384,598	766,204	289,986	10·37	2·64	3·92	729,500	..	50·0	48·3	1·7
Moola	8,662,808	878,803	329,529	10·14	2·66	3·8	814,309	0·1	76·8	22·6	0·5
Mount Sibley	3,956,013	421,411	155,057	10·65	2·71	3·91	542,543	..	40·2	56·4	3·4
Mount Tyson	9,649,578	1,031,274	361,908	10·68	2·84	3·75	823,662	6·3	90·9	2·8	..
Nanango	4,426,509	431,671	161,298	9·81	2·69	3·64	370,021	..	90·4	9·6	..
Oakey	4,281,062	445,560	166,026	10·4	2·68	3·87	438,552	1·4	91·2	7·4	..
Pauls	228,590	23,816	8,431	10·41	2·82	3·68	10,335	..	95·4	4·6	..
Pittsworth, Pittsworth	12,602,310	1,311,725	482,314	10·4	2·71	3·82	1,098,023	23·2	75·2	1·3	0·3
Brookstead	3,327,587	347,774	126,607	10·45	2·74	3·8	331,422	0·1	70·4	29·5	..
Linthorpe	4,513,008	468,608	161,477	10·38	2·9	3·57	441,554	..	80·7	19·3	..
Scrubby Mount	2,467,507	256,172	93,051	10·38	2·75	3·77	213,609	..	15·4	81·9	2·7
Springside	4,573,157	484,707	167,903	10·59	2·88	3·67	410,014	15·1	78·6	5·8	0·5
Yarranlea	7,105,562	738,934	268,116	10·39	2·75	3·77	643,213	2·5	88·4	8·8	0·3
Port Curtis, Bracewell	6,821,717	674,447	283,510	9·88	2·37	4·15	293,555	..	75·2	22·6	2·2
Theodore	3,178,309	316,035	126,850	9·9	2·49	3·97	67,002	..	71·5	28·5	..
Quinalow	8,822,412	908,533	324,848	10·29	2·79	3·68	934,694	..	85·5	14·5	..
Ramsay	3,707,249	370,610	144,756	9·99	2·56	3·9	337,258	..	46·6	53·0	0·4
Rockview	2,779,344	294,202	108,059	10·58	2·72	3·88	305,713	..	66·9	33·1	..
Rocky Creek	5,477,505	570,664	200,071	10·41	2·85	3·65	571,685	..	58·7	40·8	0·5

Rosemount	5,291,356	529,986	203,310	10·01	2·6	3·84	481,262	..	17·4	80·6	2·0
Southbrook	8,212,581	865,401	307,763	10·53	2·81	3·74	798,032	0·05	89·3	10·4	0·25
South Burnett, Goomeri ..	5,013,502	525,921	201,490	10·49	2·61	4·0	482,074	..	87·5	12·3	0·2
Sugarloaf	2,636,194	269,770	108,675	10·23	2·48	4·12	223,536	..	53·1	46·9	..
Sunnyvale	2,159,171	229,200	86,891	10·01	2·63	4·02	177,114	..	9·4	90·6	..
Warwick, Greymare	3,076,473	313,461	118,974	10·18	2·63	3·86	168,128	..	59·6	40·4	..
Warwick, Lord John Swamp ..	1,424,277	146,996	56,480	10·32	2·6	3·96	76,379	..	10·6	81·4	8·0
Warwick, Talgai	2,110,835	220,693	81,535	10·45	2·7	3·86	136,831	..	16·3	82·3	1·4
Warwick, Victoria Hill ..	1,525,720	162,656	56,062	10·66	2·9	3·67	90,077	..	8·0	88·9	3·1
Warwick, Mill Hill	15,616,351	1,630,420	606,865	10·44	2·63	3·88	660,753	8·0	86·3	5·7	..
Woodleigh	3,609,581	373,205	136,766	10·33	2·72	3·78	381,911	..	72·8	27·2	..
Yamsion	4,456,987	480,915	171,414	10·79	2·8	3·84	493,241	..	77·3	22·3	0·4
Yargullen	5,331,503	562,553	210,023	10·45	2·67	3·9	550,549	1·3	91·4	7·1	0·2
Totals	267,712,135	27,730,083	10,239,817	10·35	2·78	3·82	22,344,785	2·35	70·32	26·32	0·51

The encouraging response to the pasteurisation of milk for cheese manufacture has no doubt contributed in no small measure to the improvement in quality. Only seven of the fifty-eight factories are now not equipped for pasteurisation, and, as these factories are all small units, Queensland cheese is now mainly manufactured from pasteurised milk.

The average test of milk received was 3·82 and the range of tests was from 3·57 to 4·15. These tests reflect the suitability, from the compositional viewpoint, of milk supplies in the cheese-producing areas of this State. This is also borne out by the State's mean yield of 10.35 lb. of cheese per gallon of milk and 2.78 lb. of cheese per lb. butterfat.

The average price (including Commonwealth Government subsidy) received by suppliers was 1s. 10·06d. per lb. butterfat as against 1s. 6·58d. in 1941-42.

The use of artificially cooled holding rooms at fifteen factories, in comparison with such an installation at only one factory in 1938-39, is a pleasing feature of the progress of the industry. Its further extension to all large factories when the necessary machinery is again available should be encouraged as the final phase of the factory rehabilitation programme.

Although much satisfaction can be felt at the progressive improvement in cheese quality since the campaign was initiated in 1938, there is still ample room for improvement, and it is hoped this will be heeded by those few factories which have not given their due measure of response. Inferior cheese will not be sought after by consumers in the post-war period and factories continuing to manufacture same are likely to be forced out of production.

The attached table, prepared by Miss P. Horsley, of the Dairy Branch, and summarising operations of each factory for the year 1942-43, will prove of interest to manufacturers and producers.

SUGAR CANE AND ITS CULTURE.

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Will readers please note that VOLUME IV.—SUGAR CANE AND ITS CULTURE—of the **Queensland Agricultural and Pastoral Handbook** Series, is now out of print and, in consequence, further orders cannot be fulfilled.

Unprofitable Sows.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

PROFIT in the pig industry is largely determined by the number and size of the litters produced by sows during their lifetime. Research in England showed that, on the average, approximately one-third of piglets born alive died before reaching six months of age. In one investigation, average litter size at weaning age ranged from 5·6 pigs weaned in the herd with the lowest average to 10.5 pigs weaned in the herd with the highest. This question of sucker mortality in pig production and why some sows become unprofitable is of considerable consequence to the industry in this State, and the importance of obtaining and retaining only those sows which will produce and rear large, thrifty litters can hardly be over-estimated.

Big letters are more profitable than small litters and sows which consistently rear fifteen pigs annually pay better than those which produce only ten pigs in the same period, for maintenance cost of the sow is very much the same, irrespective of the number of pigs she rears to marketable age. The small litter at weaning and at market age is not generally due to infertile sows but rather to loss by death during suckling and final preparation for market, and as much of this loss can be avoided by careful management it is important to ascertain the nature of the causes of mortality and to consider methods for their elimination or control.

Mortality Analysed.

In England during one series of investigations 13,860 living pigs were farrowed from 1,475 litters—an average of 9·4 pigs per litter. Of these 11,340 or an average of 7·7 pigs per litter were weaned; the remainder, representing 18·1 per cent. of the total, died or were killed during the suckling period. Complete records of death covering 1,483 observations were obtained in twenty herds and these are analyzed in the following table:—

Analyses of Pre-Weaning Mortality.

Cause of death.	Per cent.
Overlaid by sow	48.7
Bad doers	22.1
Scour or diarrhoea	9.1
Insufficient milk from sow	8.0
Pneumonia and colds	5.2
Savaged by sow (cannibalism)	1.9
Accident	1.3
Miscellaneous causes	3.7

It will be seen that by far the most frequent cause of loss was reported as "overlaid by sow" and occurred in about 49 per cent. of the total litters.

As few sows can comfortably suckle more than ten or twelve pigs, some pre-weaning loss is, of course, inevitable in very large litters. For example, when 1,750 litters were arranged according to the number of pigs born it appeared that 16 per cent. of the litters contained more than twelve pigs at birth; an increase in the number of pigs surviving at six weeks occurred up to litters of twelve pigs, but where there were more than twelve pigs in the litter at birth the increase in pigs born was discounted by a higher death rate; while in litters of fifteen or over between 40 and 50 per cent. of the pigs died before they were six weeks old. This experience has been borne out in observation in Queensland where almost always more than 50 per cent. of the pigs in very large litters die within a few days of birth—that is, in litters of fifteen or more. Overlaying is usually the cause of death in such cases. While a larger litter is, in itself, a predisposing condition to high pre-weaning mortality there are equally important causes, many of which could be removed by better management, such as transferring some of the litter to other sows with small litters and hand feeding those that are sufficiently strong.

In the rearing of piglets whose mother's supply of milk was insufficient excellent results were obtained by removing the piglets immediately and feeding them on cow's milk enriched with cream so that the fat content was from 8 to 10 per cent. The amount of milk fed should be 2 ounces per pig every two hours for the first few days; later ordinary cow's milk can be given, and subsequently skimmed milk. Rolled or hulled oats can be given at ten days of age with good results.

Remedial Measures.

Overlaying may be due to clumsy, overfat, restless, nervous, or ill-tempered sows, and any system which fosters these conditions should be avoided. Clumsiness often results from over-feeding, while restlessness may equally well be caused by under-feeding. Moreover, an irritable pigman often induces nervousness and sudden movement which leads to loss in naturally docile sows. This suggests that experience in handling of live stock is certainly an essential to success. Even temperament and contentment is, without doubt, inherited, and it should be possible to obtain good tempered sows by selective breeding. Young pigs may also be killed by failure to give the sow time to accustom herself to the farrowing pen, by the absence of farrowing rails or a farrowing race, and by the use of too long or too much straw or husk bedding in the pen.

Careful observation in England shows that, assuming two litters are reared by each sow annually, roughly 10 per cent. more pigs would be produced in the summer than in the winter months. No figures are available in Queensland to show averages here, but as our winters are invariably very mild and as stock can be maintained under the open-air system the year round there should be no material difference, from a climatic point of view, between summer and winter born litters.

Death from scour and similar digestive troubles can definitely be controlled by more care, a better knowledge of management, and by removal of the cause when once that is known.

It has been suggested that unthrifty pigs should be removed from litters on the basis that they are carriers of infection, unable to with-

stand infection, and are liable to infect others. Sows and boars with skin eruptions, which, although it cannot definitely be said that these are hereditary, certainly indicate weakened constitution and should be eliminated; only uniform litters should be kept.

Post-Weaning Mortality.

A great many of the deaths between weaning and marketing age can be controlled seeing that in this group deaths due to disease often exceed those due to feeding problems. Fortunately, most of the diseases to which pigs are liable can be warded off if the animals are maintained under sound hygienic conditions and are fed on sound foods. Accidental deaths are small compared with others, and even these, which include deaths in railway waggons en route to factory or in yards while awaiting despatch, comprise but a low percentage of the total number of post-weaning losses.

Better Stock and Better Methods.

It is probable that here, as in England, the average sow is prolific enough though probably more care is exercised there than here, and while the use of reasonably prolific sows is essential to economic pig production the reduction of pre-weaning and post-weaning mortality by the practice of improved methods of management and housing presents a more urgent problem and one that can more readily be attained than by the increase of the litter size at birth. Experience in Queensland suggests, too, that better results are being obtained under the open-air grazing system than under the older and more insanitary method of sty and small bare yard system of housing.

Plate 110.

Small Yards and Over-Feeding.—A group of pigs like this will become excessively fat if confined in a small yard and fed with a superabundance of maize. The system had its place when there was a continuous demand for very fat meat; but changing market demands necessitate alteration in methods. These pigs should be running on a large area of lucerne and pasture land, and be allowed in the maize-feeding yard only an hour or two every day.

Disease Wastage in Poultry Flocks.

L. G. NEWTON, B.V.Sc.

AS a consequence of the war, the poultry industry, in common with others, has had to contend with difficulties, such as lack of labour, and increased price and scarcity of poultry foods. To overcome these difficulties, and at the same time face up to the acute shortage of eggs, flock owners are being called on to make every effort to reduce wastage and increase production.

How can egg production be increased? Many suggestions present themselves in answer to this question, but a critical examination of the situation will show that the most immediate and certain means is by the prevention and control of diseases, thereby prolonging the life of the laying hen. After all, irrespective of her potentialities the number of eggs which can be laid is determined by the length of the healthy laying life of the bird.

Disease is a most important source of wastage because not only does it take effect by directly killing off large numbers of birds, but also when death does not occur production may be greatly reduced or may even cease entirely. The latter factor is very often more important than the former, e.g., the mortality in flocks affected with black comb is seldom higher than 2 per cent., whereas production may be depressed for two-three months. In other words, the efficiency of production is greatly lowered.

The question of disease prevention and control is tightly bound up with all phases of management—breeding, feeding, housing, and other activities. Good husbandry will often stave off disease, while bad management predisposes the flock to attack.

In considering the problem on a broad basis, the first essential is to start with healthy breeding stock selected for constitution, stamina, and type. When mating the breeding flocks, therefore, a definite standard should be set, and any bird not measuring up to that standard should be culled.

With the highly intensive methods of poultry raising of the present day demanding huge numbers of chickens over a comparatively short breeding season, it would be tedious to handle each individual bird before including her in the breeding pen. On the other hand, the tendency is to "flockmate" the required number of roosters with a pen of pullets without any semblance of culling at all. This practice of indiscriminate mating cannot be too strongly condemned and is undoubtedly a cause of loss of stamina and increased mortality in poultry flocks over recent years.

The practice of pullet breeding, unheard of in earlier years, is now commonly used to obtain early chickens. It has the grave disadvantage that a bird might be a poor producer or "break down" during its pullet year. Before this is known, many of her eggs will have been hatched and the chickens distributed. By breeding from older proven birds, one at least has the knowledge that they have sufficient stamina to stand up to one year of production without ill effect.

Leucosis.

A further point well worth considering in this respect is that some authorities now believe that leucosis can be controlled to some extent by breeding from older resistant birds. It is suggested, therefore, that commercial hatcherymen should retain for hatching for their own requirements eggs from second and third year or even older birds only. By extending this procedure over a number of years it should be possible to build up a leucosis-resisting flock.

Pullorum Disease.

It should be a regular practice to have the breeding flock blood-tested for pullorum disease each year before mating, taking care to remove all positive and suspicious reactors from the breeding pens. While an annual test carried out in this way cannot be calculated to bring about eradication except perhaps over a number of years, it has undoubtedly been responsible for a great reduction in chicken mortality in their first week of life.

Coccidiosis.

Coccidiosis accounts for more losses, and is more difficult to control than any other specific disease of chickens. The most effective control measures consist of strict attention to sanitation, cleaning up regularly every 24 hours in acute cases. To facilitate cleaning, each unit should be of convenient size, e.g., 100-250 chickens. A light covering of litter on the floors will assist in drying out moisture in the droppings and, at the same time prevent the droppings from sticking to the floor. Although many medicinal treatments have been prescribed, their value is limited and, if used, they should be combined with measures of sanitation. Every effort should be made to anticipate the outbreak and apply immediately the most intensive methods of control. The usual age of infection is from six to eight weeks, but early hatched birds may escape it entirely, while it may occur as early as one week old towards the end of the season.

Wrong Poultry Practice.

With regard to other losses in chickens, it can be surprisingly but truthfully said that more chickens die every year from incorrect management than from specific diseases. Brooding is one of the main factors in determining the ultimate productivity of the full-grown bird, and undoubtedly many birds are prevented from ever reaching their potential production because of setbacks in their early life. As far as practicable, brooding should be under the supervision of one person to obtain uniformity. The comfort of the chickens should be the guiding factor in deciding the correct temperature rather than any arbitrary level. The effects of overheating and lack of ventilation are equally as serious as underheating or chilling.

Fowl Pox and Worms.

From six weeks onwards the two diseases of young stock to be guarded against are fowl pox and worm infestation. The former disease may be considered endemic in the Brisbane metropolitan areas. For this reason, greater use should be made of vaccination in the prevention of the disease. Whilst there is still a great deal to be done in the standardizing of vaccines, reliable ones are available on the market and wider use of them is recommended. It must be stressed, however, that only healthy birds should be vaccinated; vaccinating unthrifty birds or those suffering from any obvious disease is only courting trouble. It is also important to remember that if a portion of the flock is vaccinated, the disease will occur, very often severely, in the remainder of the young birds. It is essential, therefore, that all young birds be done at once.

Worm infestation is most severe among growing stock, about twenty-five adult Ascaradia being pathogenic, while older birds can withstand up to forty. Worm parasites often assume pathogenic importance, particularly where chickens are being reared semi-intensively or on unspelled ground. Treatment in these cases is necessary and should be applied promptly and the birds then moved to fresh quarters. The most satisfactory treatment consists of a flock administration of nicotine sulphate of which a limited quantity is available. The drug is added to a wet mash at the rate of ·5 ccs per 1 lb. of food and fed over a period of four to six days. Drug treatment is of little value, however, unless combined with strict sanitation measures. If the birds are treated and returned to dirty pens they quickly become reinfested.

Disease Control.

Leucosis is now more prevalent in Queensland flocks than any other disease, and because of lack of knowledge of the cause and its mode of action it is difficult to set down definite control methods, but the following recommendations should be helpful:—

(*a*) Breed as far as practicable from two- to three-year and even fourth-year hens in the hope of gradually increasing the resistance of the flock.

(*b*) Handle growing pullets with the utmost care. Sudden changes in feeding or housing, frights or forcing, particularly at the time of commencement of laying, are likely to bring on an attack.

(*c*) Cull birds showing signs of the disease heavily.

Outbreaks of blackcomb are now confined mainly to growing pullets and its worst effect is to retard the onset of laying. There is no specific treatment but dosing with Epsom salts in the early stages tends to bring about quicker recovery.

The relationship of feeding to disease control has been clearly demonstrated over the past year. It seems quite certain that the use of substitute foods, as a result of shortage of wheat products, has been the cause of the appearance of curled toe disease—caused by a deficiency of riboflavine—for the first time in this State. This disease was diagnosed in several flocks, all being fed the same ration, and the affected birds quickly responded to a corrected diet.

Poultrymen who mix their own rations are advised to give careful consideration to the purchasing of apparently cheap foods. Standard

feeding tables should be consulted, and if not familiar with these, poultrymen should obtain expert advice on the comparative food value in terms of protein and carbohydrate content, &c., as well as their relative monetary value. Care should be taken to include the correct proportion of each ingredient, for when a substitute food is added the whole ration may require re-balancing.

Repeated or sudden change of the ingredients is always apt to cause a check in laying, and any change should be introduced gradually.

Although it may seem costly in the initial outlay, it is more economical over a given period to feed the maximum in quantity and quality. It is recognised to-day that a high intake of good quality food will give increased production, growth and resistance to disease.

When computing rations, the protective foods, i.e., the vitamins, should receive due consideration. The two important ones at present are A and riboflavine. There is little excuse for the occurrence of vitamin A deficiency in Queensland flocks as there are so many vitamin A-rich foods available, e.g., yellow maize, green feed, lucerne chaff, and codliver oil (pilchardine). It would be false economy to exclude all sources of this vitamin from the ration, although their initial cost may appear high. Similarly deficiency of riboflavine can be prevented by including bran, livermeal, milk, etc., in the chicken ration.

With the temporary boom in the industry, many poultry farmers may be tempted to rear "a few more chickens," and thus add an extra burden to their already overcrowded accommodation. There are very few commercial farms which are not at present overcrowded to a risky extent. It has been proved that the incidence of disease increases directly in proportion to the increase in overcrowding.

It is preferable to raise chickens intensively on a concrete floor well covered with litter until they are four to six weeks of age, after which they may be given range with "arks" or colony houses. In this way fresh ground for each batch of chickens can be arranged. With the semi-intensive system the runs become heavily charged with parasite eggs, coccidia, etc.

Laying birds when housed intensively should be given ample floor space, as it has been proved that overcrowding gives decreased production and increased mortality. At least 4 square feet should be allowed for each bird with the intensive system.

The regularity of cleaning poultry houses and the choice of litter are points which might well be left to the discretion of the individual poultry farmer. It is pointed out, however, that the litter should be 4-6 inches deep to provide scratching exercise and at the same time dry out moisture from droppings and litter.

Disinfectants are valuable in maintaining proper sanitation, e.g., in incubator and brooder disinfection. Care should be taken in selecting a suitable disinfectant. Points to be taken into consideration are the cost, efficiency in the presence of organic matter such as droppings, ease of application, and the time required to kill germs. Their odour is no guide to their effectiveness, and often those which appear costly initially are most economical.

Summary.

The most obvious means of reducing wastage and increasing egg production by the prevention and control of disease may be summarised as follows:—

(1) **Breed only from birds of a definite standard of stamina, constitution, and health.**

(2) **Blood test each year for pullorum disease.**

(3) **Endeavour to anticipate coccidiosis. Rely mainly upon sanitation for its control.**

(4) **Pay particular attention to brooding.**

(5) **Vaccinate against fowl pox or in areas where the disease occurs every year.**

(6) **As a means of combating leucosis—**

- (a) **Breed from older birds.**
- (b) **Cull heavily.**
- (c) **Manage pullets carefully.**

(7) **Practice regular hygiene to prevent worms reaching harmful numbers.**

(8) **Feed a well balanced ration of good quality food.**

(9) **Avoid overcrowding. Rear growing stock on fresh ground or free range.**

HANDBOOK VOLUMES OUT OF PRINT.

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Because of an extraordinary demand for the **Queensland Agricultural and Pastoral Handbook,** stocks of—

VOLUME III.—INSECT PESTS AND PLANT DISEASES, and

VOLUME IV.—SUGAR CANE AND ITS CULTURE

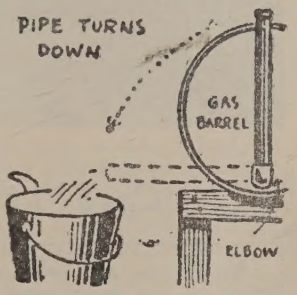
are now exhausted.

Copies of VOLUME I.—FARM CROPS AND PASTURES, and VOLUME II.—HORTICULTURE—are still available at the prices stated in the advertisement on the back cover of the **Journal,** on application to the Under Secretary, Department of Agriculture, Brisbane.

GADGETS AND WRINKLES

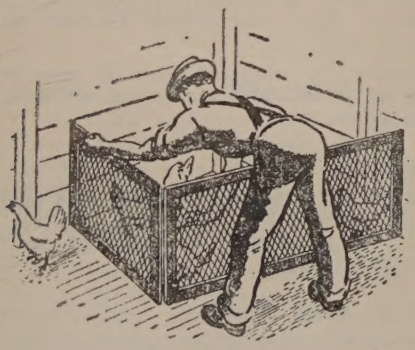
A PETROL DRUM STAND.

This device makes lifting a petrol drum unnecessary. With 4 x 4 material a stand is made to keep the drum eight inches or so off the ground. Into the end of the drum a 2½-inch nipple on a ¾-inch pipe is screwed. To this is connected a ¾-inch elbow and 20 inches of ¾-inch pipe, threaded at both ends. When petrol is wanted the screw cap is removed and the pipe to the left turned down until the petrol runs into the bucket. To shut off, the pipe is lifted to the upright position again and the cap replaced.



NAIL-DRIVING WITHOUT TEARS.

To drive a nail in an awkward spot without the risk of damage to your thumb, first thrust the nail through a piece of stiff paper and hold this instead of the nail.



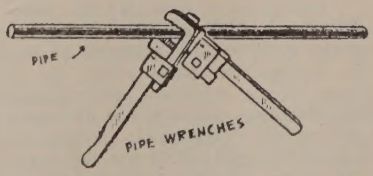
CATCHING CHICKENS.

A hinged panel covered with wire netting makes it a simple matter to catch chickens in the house or in the corner of a pen. A long panel (5 to 7 feet) and a short one (2½ to 3 feet), both the same height (30 to 36 inches), hinged together is used as shown. Panel frames are 1 x 4 timber covered with 1-inch wire netting.

With a light weight portable panel like this, chickens of any age can be easily and quickly held in the corner of the pen for culling or for testing or for any other purpose.

IMPROVISED PIPE VICE.

The accompanying sketch shows how to assemble a handy emergency pipe vice by using a couple of pipe wrenches. Set the wrenches with the jaws facing in opposite directions and the handles spread at an angle. Put the pipe in the wrenches as shown and with the left hand hold it firmly against the ground while it is being cut.



TIGHTENING LOOSE THREADS.

One layer of fine brass gauze wrapped round the thread will usually do the trick. This has been found to be particularly effective on worn gland nuts from pumps and stuffing boxes.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SAVE THE BABIES.

THE hot season is coming. Probably more babies will become ill during the next three months than during any three months in the year. It is—though it should not be—a dangerous season for babies. They may become ill from an infectious but preventable disease.

Summer diarrhoea, dysentry, gastro-enteritis, by whatever name it may be called, is an infectious disease. It is caused by germs which are carried about by flies. What can mothers do to save their babies from it?

Natural Feeding.

The first way to save the babies is by giving them their natural food; the food which is perfectly clean, fresh, and safe. Never wean the baby during the next three months if it can possibly be avoided. If it is necessary to wean him, or if he has been weaned already, the problem is a much greater one.

Care of Milk and Other Baby Foods.

Most women who have to keep house in a sub-tropical climate hope that post-war housing plans will ensure that domestic refrigeration will be available to all. In the meantime, the baby's milk will probably have to be kept fresh without it—often without ice also.

The germs of dysentry are never present in freshly boiled, scalded, or pasteurised milk, for boiling or pasteurising kills them. So the first thing to do is to make up the baby's milk mixture as soon as the milk is delivered, following carefully the written directions which the doctor or the sister at the Welfare Centre has given. Then cool the milk quickly by placing the jug—well covered with two thicknesses of mosquito net or coarse muslin—in running water or frequently changed cold water. This quick cooling is most important. As soon as the milk is cool, it should be placed in the ice chest, or failing that, stood in a pie dish filled with cold water, allowing the muslin covering to dip into the water all round. The dish should not be stood in the kitchen or in a closed cupboard, but in a safe in a draughty place in the open air on the shady side of the house. Milk and other foods should be kept away from dust and as far as possible from drain openings, rubbish heaps, or garbage of any kind. The Welfare Centres have a good pattern for a cooler which can be made from rustless iron or kerosene tin, but materials to make it may present a difficulty at the present time.

Pasteurised milk delivered in sealed bottles should never be placed in water, which in summer may be warmer than the milk and so cause it to go bad. The bottles should be placed in an ordinary wooden candle box and surrounded with clean chaff or sawdust, and kept in an outside safe or other cool, airy place. By this means bottled milk delivered cool at the house may be kept cool and safe for a whole day even in hot weather. Pasteurised milk, not sold in bottles, should be treated as warm milk and scalded.

If in the country and there is nothing but tank or bore water to depend on, it should be remembered when the weather is hot to keep a bucketful of water in the open air all night and, in the morning, shaded from the rising sun. In this way, the baby's milk may be successfully cooled.

Dried milks, sugar, and all utensils used in the making of baby's foods should be well covered from flies. It is a good plan to have a small table kept specially for the baby's things and covered with a voile or muslin cover weighted at the corners. Bottles and teats should be very carefully treated—the Welfare Centre sister will show you how to clean them and keep them so that they will not constitute a danger to the baby.

Burn the dummy—nothing that can be done will make it safe. It should be remembered that one fly on the dummy or on a baby's food may spell death or a severe and weakening illness for the baby. It is not said that every mother who does her very best will never have a sick baby, but it is asserted that such babies will not become ill so easily and they will recover much more quickly. The health and the lives of our Queensland babies are in the hands of Queenslanl mothers. This summer everything should be done to save the babies, who are so valuable to the country, especially at the present time.

Questions on this and any other subject concerning maternal and child welfare will be answered by communicating personally with Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

Vegetable and Bone Soup.—Take a pound of shin of veal or mutton, or bones of some young animal—lamb, chicken, kid, rabbit, &c.; chop up so as to expose marrow; place in a saucepan and cover with one and a-half pints of cold water, and half to one tablespoon of malt vinegar, but no salt. Simmer gently for some hours, the longer the better, add a handful of mixed vegetables and simmer again for one hour; strain and make up to one pint, and allow to set into jelly. Practically any vegetables may be used, according to the season, and should include, from time to time, cabbage, spinach, lettuce leaves, turnip tops, beans or bean strings, carrots, parsnips, turnips, onions, cauliflower, fresh or dried peas, celery, potato, pumpkins, &c. From time to time add other odds and ends, such as a piece of liver or brains, or a teaspoon of marmite, sweetbread, and so on. By varying the constituents of the soup, a variety of necessary elements is ensured in the child's food. Do not skim all the fat off the soup as it is mostly marrow fat and very nutritious. This soup can be used on two consecutive days if it is brought to a boil at night and kept in a cool place.

American Soup.—Take 1 lb. neck mutton, ¾ lb. peas (fresh, dried, or split), ¾ lb. tomatoes (fresh or tinned), 1 onion, 1 carrot, 1 turnip, saltspoonful of sugar, a little celery, pepper, salt, 2½ quarts water.

Soak the peas and put them in a pan with the mutton and water. Boil up, then add onion, carrot, turnip, and celery, cut into small pieces, and the sugar. Boil slowly for two hours, then add the tomatoes, also cut up small, and boil for half an hour longer. Take out the meat and put the soup through a fine sieve. Return it to the saucepan, add the pepper and salt, and serve with small squares of fried or toasted bread.

Brown Stew of Tripe.—1 lb. tripe, 4 onions, 1 oz. butter or good dripping, 1 tablespoon flour, ½ pint water or stock, salt and pepper. Soak tripe and scrape it, put into cold water in saucepan and bring to the boiling point; drain tripe and cut into neat squares. Prepare onions, cutting them into slices. Melt butter in a saucepan, add onions, and fry a golden brown; add flour, brown lightly, add water or stock, stir till boiling, season; add tripe, and allow to simmer gently for two hours.

Minced Tripe for Children.—Cleanse the tripe, and pass it and a peeled onion through a mincing machine. Sprinkle with salt and pepper, and put in a saucepan with a little water. Simmer for three hours. Blend one and a-half tablespoonsful of flour smoothly with a cup of milk; add this to the tripe and stir till it boils. Simmer ten minutes longer and serve.

Cheese and Potato Pie.—3 or 4 large potatoes, ¼ lb. dry cheese, pepper and salt, ½ teaspoon marmite, ½ pint water.

Method.—Peel and slice potatoes and grate the cheese; dissolve the marmite in the water; line a piedish with slices of potatoes, put a layer of grated cheese on these, and then another layer of potatoes, cheese again, and so on, until the dish is full, having potatoes on the top. Season each layer and then pour over the water and marmite. Cook slowly one hour.

Cucumbers with Parsley Sauce.—Peel the cucumbers and put them into boiling water, slightly salted, and cook for ten minutes. Drain well and cut into slices about an inch thick. Melt a little butter in a small frying pan, put in the cucumber and some fried sliced eschalot, salt and pepper, toss over the fire for a few minutes, then add a cupful of white sauce and chopped parsley. Cook gently for five minutes.

Steak and Kidney Pudding.—Take 1½ lb. stewing steak, 1 lb. bones, ¾ lb. flour, pinch salt, ½ lb. ox kidney, salt and pepper, 6 oz. suet, water or stock.

Wash bones, place in a saucepan and cover with cold water. Bring to the boil and skim, then season to taste and simmer for three hours. Cut steak and kidney into small pieces, roll in flour seasoned with pepper and salt to taste. Sift flour and salt into a basin. Mix in the shredded suet, and add enough cold water to make into a stiff paste. Cut off one-third of the paste for a lid.

Roll out remainder of paste, and line a greased pudding basin with it. Put in the steak and kidney. Almost fill basin with stock from the bones, or if you do not have bones, use water. Roll out paste for lid and fix over basin, pressing the edges well together. Cover with greased paper and then with a floured pudding cloth. Tie down with string. Place basin in a saucepan of boiling water to cover, put on the lid and boil for 3½-4 hours. Enough for six to eight persons.

Dried Fruit Tart.—One half cup seeded raisins, one half cup currants, one piece shredded lemon peel, dried apple, one tablespoon sugar, one half cup water, the juice and grated peel of half a lemon, nutmeg, and a little salt, one teaspoon of butter. Mince the apple, and boil all together for fifteen minutes, line a tart plate with pastry rolled thinly, put in the mixture when cold, and cover with pastry. Mark the edges neatly, brush the top with milk, and bake for about thirty minutes. Dried apple should be soaked the night before and cooked before adding to the other ingredients. Dried peaches or apricots can be used. The raisins and currants can be omitted, but add very much to the flavour and nourishing qualities of the tart.

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